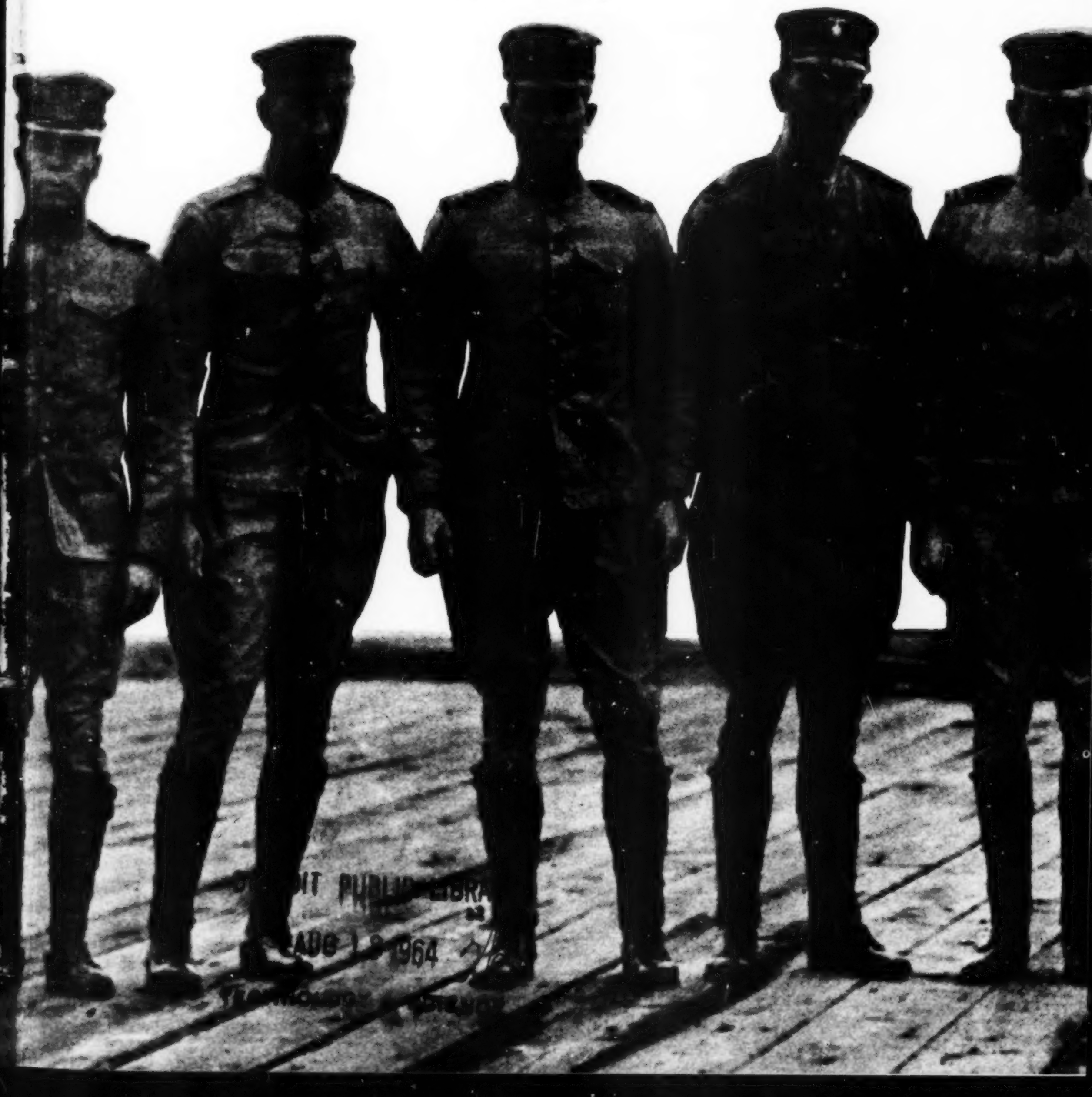
approach

AUGUST 1964 THE NAVAL AVIATION SAFETY REVIEW

POINT OF ORIGIN
How well have early ideas held up?

DESIGN SAFETY
Why can't it be in that very first blueprint?

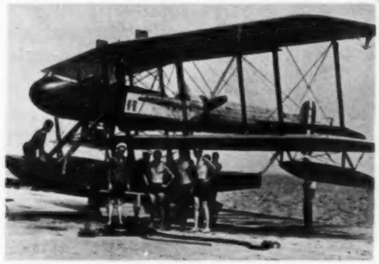
V. 10 #2

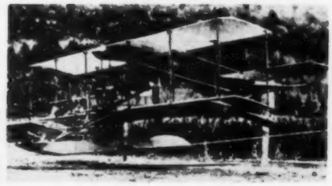


POINTC

T OF ORIGIN

By CDR R. P. Brewer





This one is for those of you who might grow a bit weary of the nature of some of the professional patter occurring nowadays. Possibly all those lively discussions of thermal barriers and cryogenics and re-entry heat problems leave you slightly cold; if you're unmoved by the idea of the "negotiated pause," and if the principle of the "controlled response" somehow fails to soften the seat of a long-range, low-level flight, why, just maybe you'll go for another backward glance over your shoulder.

By way of introduction, much of the information included here was obtained from one of the earliest and most authoritative forums of aviation thinking —the English *Aeronautical Journal,* a monthly publication of articles and discussion which was in existence at the turn of the century. The impression that the ideas expressed in it and other early publications, such as *The Aeroplane,* contained an astonishing amount of vision and creative imagination becomes even more convincing when you consider that the brothers Wright were then still evaluating winds aloft reports from a place with the unlikely name of Kitty Hawk, N. C.

So, as perhaps you note the surprisingly modern thinking of these excerpts, it might be well to keep in mind that these aren't clippings from *Aero Digest* of a few years back, nor even current tidbits from APPROACH the "Monitor" of Aviation Safety Council meetings. And, a proper question might be: Will *your* present professional thinking and opinion be considered as meaningful and impressive 60 years hence?

Volume V, No. 19, of the *Journal,* in July 1901 carried an article bearing the now-familiar title "The Angle of Incidence," submitted by a not-too-well known experimenter by the name of Wilbur Wright. At the time of his writing there existed a well-established school of aerodynamic thought based on the ornithopter, or wing-flapping principle of flight. In demolishing some opinions expressed by a member of this group, the elder Wright brother commented that: ". . . the calculation of the angle of incidence . . . would scarcely be so seriously in error as that of a well-known writer based on observation of soaring gulls. . . ." Young Wright (he was about 34 at the time) added that "The angle of incidence is fixed by area, weight and speed alone. It varies directly as the weight, and inversely as the area and speed, though not in exact ratio." Sound familiar? It should, it's the fundamental we later practitioners of the art frequently insist on ignoring—and just as frequently find ourselves wishing mightily for a personal set

Cover: Commissioned Officers of the Aviation Corps USN. L To R: Lieut. V. D. Herbster, Lieut. W. M. McIlvain, Lieut. P. N. L. Bellinger, Lieut. R. C. Saufley, Lieut. J. H. Towers, Lieut. Commander H. C. Mustin, Lieut. B. L. Smith, Ensign de Chevalier and Ensign M. L. Stolz. Taken at Naval Aeronautic Station, Pensacola Fla., March 1914.

of ornithopter wing-flappers to get us out of, say, an undershoot situation.

In October of 1901, a gentleman by the name of Patrick Y. Alexander, more than 10 years before Dr. DeForest developed his radio tube to ultimately give us Guard Channel for our transmission checks, wrote in the *Journal* that: "Hertzian waves (we call them radio waves now) have a power that lends itself to control the direction of small flying machines. . . . Provided with a compass . . . and apparatus that will give their direction and distance from the station. The compass, in connection with automatic gear, gives the course to the station . . . which activates apparatus that instantly guides the machine until she is steering the correct course."

And, as if it weren't enough to indicate the principles of tacan and auto-pilot in one paper, Mr. Alexander went on to suggest the use of Selenium, which is sensitive to light, to obtain steering by flames and by peculiar sounds. Any heat-seeker guidance systems folks listening?

Such a mechanism, Alexander then predicted, in complete ignorance of the sonic barrier which hadn't been encountered yet, "can be arranged to control the flight of machines even if they are going at the rate of upwards of 1000 miles per hour."

Half a century B. C. (Before the Center), in July 1903, a Major L. S. Blackden expounded some basic man-machine relationships which endure despite the worst efforts of Dilberts and the like. The Major concluded from a series of experiments with cardboard airfoils and gliders used in exploring the "angle of fall" and attendant stability problems: ". . . for the present and for some time to come, safety will depend chiefly on the skill of the aeronaut and the constructional strength of the machine."

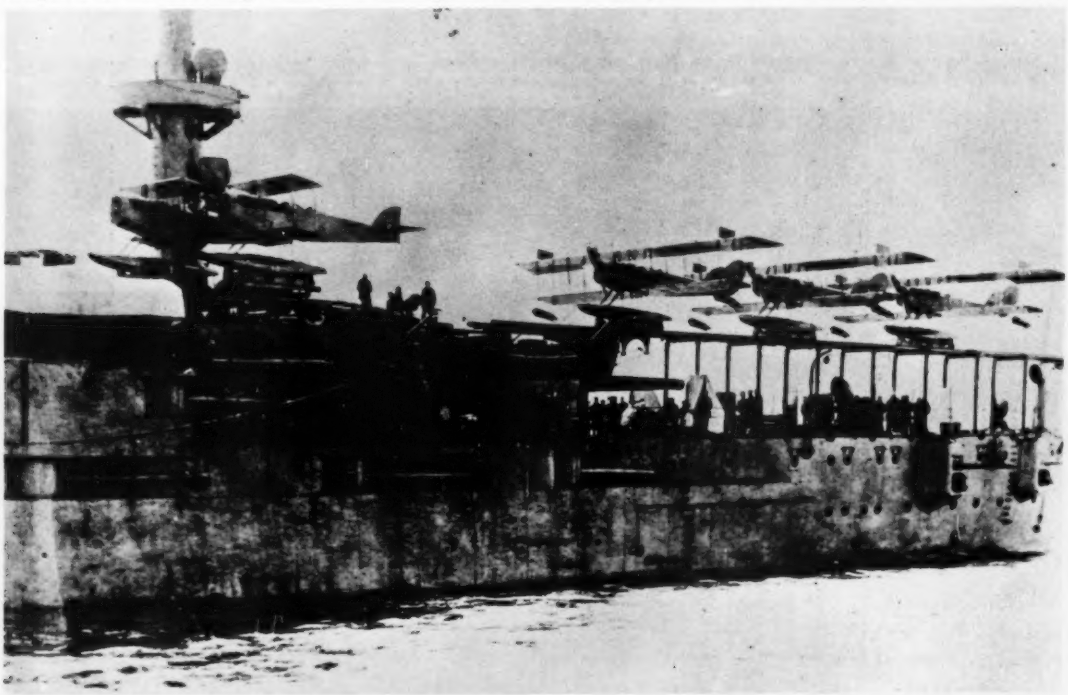
Now, just to depict our aeronautical forebearers as being entirely human at times, it is well to record the opinions of at least one early birdsman who did not share his contemporaries' enthusiasm for the fixed wing principle. Said Mr. E. E. Wilson, Esq., in a July 1908 article: "The aeroplane . . . should now be rendered utterly obsolete, their employment arbitrarily eschewed and the principle relegated into one of limited possibilities. It has no true stability . . . unsafe . . . as a scientific aerodynamical machine it is a failure . . . for war purposes it is utterly worthless." His answer? The ornithopter principle of the flapping wing. (Ed. Note: Whatever became of old E. E.? Never see him around Farnsborough.)

About four years later, on January 4, 1912, an editorial in *The Aeroplane* just as roundly decried the possibility that aircraft might be practically operated off decks of ships. And to indicate the embarrassing uncertainties of the publishing business, six days after *that* there occurred the first airplane

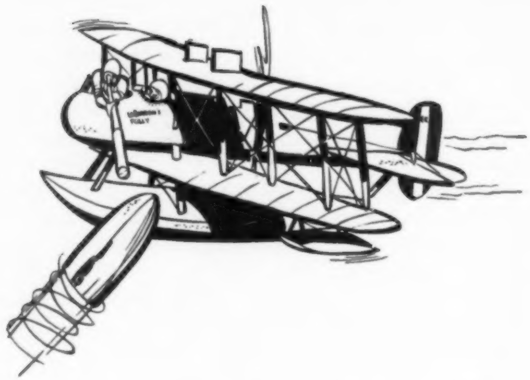
flight from a British warship!

But this sort of thinking appears to have been rather limited and of little real significance when compared to the following "Note" which might have appeared in an APPROACH of October 1910: "There were a regrettably large number of fatal accidents during the year in aviation . . . unfortunately the exact cause of most of them are unknown . . . numberless mishaps of a less serious nature have occurred, also generally from an unknown cause. The usual method of reporting accidents is: '. . . while flying at a considerable height fell with his aeroplane. The machine was broken to pieces, the aviator is slightly (or severely) injured.' In this way accidents which might help progress by showing where faults lie, are rendered worse than useless. It should be the business of aeronautical authorities in each country to investigate every serious accident and publish a report. . . ."

Meantime, back at the aerodrome, things moved right along after Kitty Hawk, with the military beginning immediately to exploit the use of the airplane, as we well know. Then, too, the learning process was frequently painful as man adapted to a new environment, as witness this item in the "Notes" of October 1912: "First aviator to be killed in war was a scout of the Bulgarian Army . . . brought down by gun fire whilst making a reconnaissance at



The cruiser NORTH CAROLINA was the first equipped with a catapult and in 1915 was carrying N-9 seaplanes with as much pride as the modern carrier does its fighting jets.

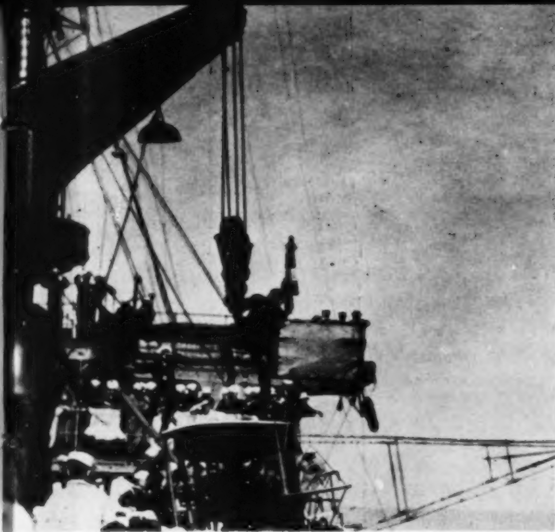


Adrianople. He was Lt. A. Popoff (a Russian) flying a Wright biplane. The incident does not, however, throw much light upon the question of aerial reconnaissance as it is understood that Popoff did not take proper precautions to avoid being hit."

Whatever the immediate tactical lessons, jink-wise, learned from pilot Popoff's demise, the same issue noted the overwhelming importance of the need to develop an "aerial law code." And although this undoubtedly was aimed at a ICAO-type body of regulations, one can't but picture the stern English disapproval registered over not "getting him on the rise, old boy."

On the more technical side, another 1912 discussion, of comparison of Army trial machines, included as bearing on the problem of landing techniques Mr. A. V. Roe's suggestion of reversing the propeller when a few feet off the ground ". . . by controlling the angle of the propeller blades, as in a marine launch." From which original thought all ex-P-2 and P-5 drivers may extract some small solace for having contributed to the experience which has subsequently supported Mr. Roe's idea of the runway stretcher. Of course, Mr. Roe was probably refer-

One of the first aircraft purchased by the Navy was a Wright landplane which was converted to a seaplane by installing a specially designed float. It is shown as it appeared afloat shortly after its conversion in 1911, in Baltimore Harbor.



A month after Eugene Ely landed successfully on the deck of the PENNSYLVANIA, Glenn Curtiss landed his Hydroaeroplane alongside and was hoisted aboard. This was his answer to the following challenge written to him by the Secretary of the Navy: "When you show me that it is feasible for an aeroplane to alight on the water alongside a battleship and be hoisted aboard without any false deck to receive it, I'll believe the airship of practical benefit to the Navy."

ring to the four to eight pounds-per-square-foot wing loading factor of the time—a mite lighter than the *Neptune* or the *Mariner*.

The most fascinating statement of the year, certainly insofar as the long-range, low-level set is concerned, must have been contained in the July 1912 "General Meeting Discussion" recorded by the *Journal*: "Mr. Ledboer said that . . . 'if the machine were fitted with a wireless one could communicate observations, and this also did away with the need for landings.' " To which the LRLL gent may add a groan of affirmation.

Finally, *The Aeroplane*, in January 1912, considering "The Prevention of Future Accidents," noted that "nine aeroplane accidents out of 10 are absolutely avoidable. So far as the aviators are concerned . . . one is confronted by the fact that nearly all the best men have more or less interest in the trade, and of the rest, a dangerously large number belong to the class aptly described as 'cloche stirrers'—men whose only idea of flying is to get into a machine and stir the control lever hither and thither without in the least realizing why they do so beyond the fact that certain results probably follow certain movements."

So, for any latter-day "cloche-stirrer" types, be advised, sirs, by this very clear voice from the past—whether you fly an aeroplane, a jet, a capsule, a reentry vehicle or a space probe—the principles of the elders remain quite valid. And wise indeed is he who profits by the experience of others.

Only in this way may we avoid hearing a very small voice echoing across the years the cloche-cliche: "I *told* you so!"

IT STILL HAPPENS

The Price: The life of a pilot, serious injury to a passenger and loss of a T-1A aircraft. If you are still unable to identify the culprits, check page 28 for details.

TRUTH and CONSEQUENCES

NO MARGIN FOR ERROR

The accident occurred on a tactical flight, flown during an Operational Readiness Inspection. Flight mission was to attack a pre-placed convoy. The maneuver to be performed in this search and attack mission was to search at an altitude of 200 feet at an indicated airspeed of 240 knots with one quarter flaps.

Roll-in altitude after "pop-up" was to be 2800

feet AGL and was to be attained upon sighting the target by going to 100 percent power, pulling up sharply, and slowing to a minimum of 180 knots at point of roll-in. Upon reaching roll-in altitude, power would be reduced to 90 percent and a 20-degree glide entered. Bomb release was to have been at 1300 feet AGL, between 280 and 300 knots. Recovery was to be effected at a minimum of 1000 feet AGL. This maneuver, described as "low and slow," is utilized to enhance searching and to keep the target in sight once it is spotted.

Here is the wingman's account of the flight.

"I was number two in a flight of four. We were each carrying four Mk-86s, 150 rounds of 20mm and one external 300-gallon fuel tank on the centerline. . . . As we crossed the convoy, I was on the lead aircraft's starboard side approximately two to three hundred feet. In pulling up, the leader made a slight turn to starboard to set the flight up for a port turn roll-in. At this time I had full internal fuel and perhaps a few hundred pounds in the drop tank. I dropped my flaps one quarter and began to take more interval on the number one aircraft by moving to the outside. I remember thinking that it appeared the leader had not dropped his flaps.

"I had gone to 100 percent as we started climbing and tried to spot a target to the right of the one the leader rolled in on. Passing 1900 feet at 200 knots, I saw the leader rolling in a tight turn to the left, 300 or 400 feet above me. I recall looking at my altimeter as he rolled in and thinking that he was much too low. I continued climbing in a port turn as I watched number one, and picked out a target to his right—a colored truck, either red or orange.

"I must have been aware that he was too low, for I don't remember my own roll in altitude and I was watching the number one aircraft. I thought he hadn't released any ordnance and that he was going to pull out because he hadn't had enough tracking time and was too low. I then saw the nose of the aircraft come up as he obviously tried to pull out."

The suspected primary cause of this accident is pilot factor. The pilot exercised poor judgment when early in the bombing run he failed to recognize an almost impossible situation and initiate an early abort.

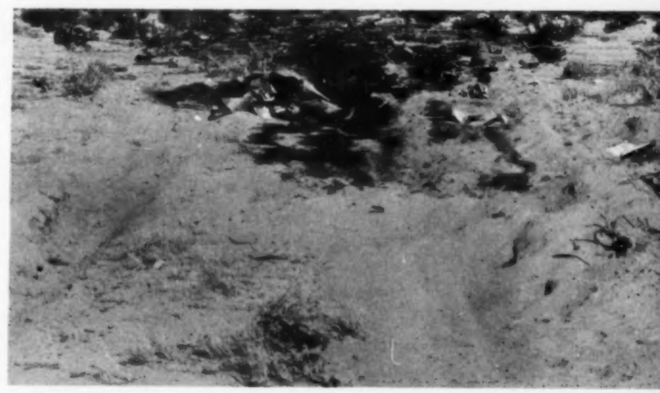
This pilot was an experienced naval aviator who had accumulated over 3000 hours in military aircraft during 9½ years of flying. His assignment as operations officer, which includes the overall responsibility for pilot training, made it necessary for him to be very familiar with all aspects of each maneuver performed by the squadron.

However, he had a natural trait which could be both advantageous and detrimental, depending upon the situation and environment. This trait was an extreme sense of pride in himself, and the service. On occasion it prevented this pilot from admitting to himself and others that he had erred. He had a strong desire to impress other aviators as to his ability and would attempt to salvage a poor situation to do so.

The probability of this pilot's "overpride," placed in the environment of an ORI with a senior inspector observing, combined with a poor approach to the ordnance run, apparently completed the sequence of events which ended in disaster.

The "Low and Slow" is basically a sound maneuver. It is a precise maneuver, equally as demanding as the carrier approach. The pilot must know the capabilities and limitations of his aircraft and consider altitude, gross weight and load factors to complete the maneuver in a safe and accurate delivery.

The fact than an experienced aviator placed himself in a position that a low pull out or contact with the ground was unavoidable is an area of great concern. Aviators must know and adhere to their capabilities and limitations. Constructive criticism is an important phase of training. Every naval aviator must exercise personal integrity and above all be honest with himself.



The pilot just had to make a hit . . . and he did!

RETREATING

The history of helicopter development indicates that certain design characteristics were emphasized as the mission requirements have grown. For example, load carrying capability, extended range, simplicity and hover capability are some of the characteristics that have been developed to fulfill certain mission requirements. Vertical lift-off, hovering and landing capability are characteristics that have been unique from all other operational types of aircraft. High speed characteristics have been secondary considerations since these roles have been accomplished by fixed wing type aircraft.

Recently there has been interest to increase productivity (ton-miles/hr load carrying capability) for helicopters and to reduce vulnerability to enemy fire. This then implies that speed is increasing in importance.

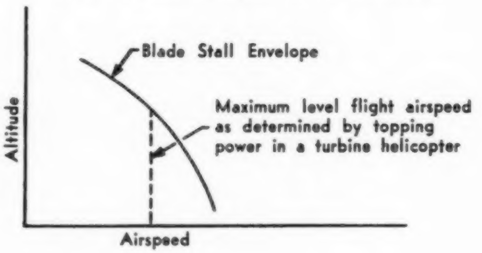
As in other technologies, any proposed significant advance is faced with a significant problem. This was the case with the helicopter a few years back when the problem of under-powered helicopters was solved by the advent of the turbine engine. So it is now that any significant advance in speed is faced with the problem of retreating blade stall.

Retreating blade stall is the loss of lift caused by separation of airflow on the retreating rotary wing airfoil. Since most rotor systems turn counterclockwise, retreating blade stall occurs on the left side of the helicopter. Lift is proportional to blade angle of attack and relative wind velocity over the blade. On the retreating blade, the resultant velocity is equal to the rotational velocity minus the forward speed of the helicopter. Therefore, as airspeed is increased, a corresponding increase in retreating blade angle is required to maintain lift. When the retreating blade angle-of-attack reaches the stall point, blade stall occurs. This is analogous to stalls in fixed wing except retreating blade stall occurs at the high airspeed end of the flight envelope whereas fixed wing stall occurs at the low airspeed end of the flight envelope.

How Can Blade Stall be Encountered?

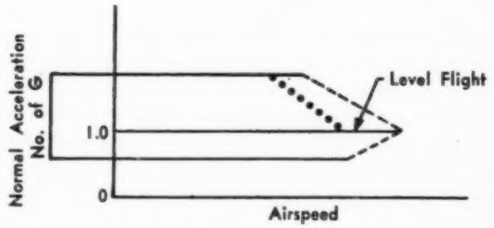
Early helicopters were underpowered so that the matching of engine shaft horsepower to rotor RPM was accomplished without encountering serious blade stall problems under normal operation at low altitudes. As an added safety feature students were merely taught to refrain from diving helicopters at high speeds. With the advent of the turbine powered helicopter and high altitude flight requirements, it is now possible to fly into retreating blade stall in level flight at higher altitudes as shown in Figure 1:

Fig. 1. Typical Helicopter 1G Flight Envelope



Blade stall can also be encountered in maneuvering flight since effectively higher lift forces are necessary to produce normal accelerations. A typical flight envelope for a helicopter is shown in the V-n diagram of Figure 2. This diagram is drawn as a result of testing and is generally near stall with a small margin of safety:

Fig. 2. Typical Helicopter Maneuvering Flight Envelope



What Variables Affect Retreating Blade Stall?

The dashed lines shown on Figure 2 will move toward the dotted lines or decrease the usable en-

BLADE STALL

By LT W. H. SALO
Rotary Wing Branch
Flight Test Division
Naval Air Test Center

velope whenever:

- Gross weight is increased.
- RPM is decreased.
- Density altitude is increased.

A V-n diagram could be drawn for every change in any one of these factors but is usually shown in the flight manual in the form of a nomograph where the limiting airspeed may be found using any combination of variables. Other variables such as blade contour and blade roughness affect stall but are of no real direct concern to the pilot.

What are the Characteristics of Blade Stall?

Retreating blade stall is characterized by any one or a combination of the following depending on the model helicopter:

- Nose up pitching.
- Rolling.
- Loss of control effectiveness.
- Roughness or vibration buildup.

What are the Consequences When Encountered?

There have been very few reported accidents that have been directly or indirectly attributed to blade stall. However, in one instance an entire rotor head and transmission were lost in flight during a contractor flight demonstration at the Naval Air Test Center due to high vibratory loads. Vibrations as high as $\pm 0.40g$ 1/rev and $\pm 1.35g$ 4/rev have been recorded in other tests at the Naval Air Test Center; however, normal flight vibrations are generally less than $\pm .15g$. Frequent or sustained operation at high vibration levels imposes heavy control loads and component life is shortened due to fatigue. Also we must not forget that the helicopter has not been designed to withstand high maneuvering or vibratory loads as permissible in fixed wing aircraft (i.e.,8g) and we cannot expect them to withstand normal accelerations in excess of 2—3g.

Another danger to be avoided is diving the helicopter. Entry into stall under this condition may preclude recovery in time since decreasing airspeed will be difficult and increased load factor will inevitably result which in turn will aggravate the retreating blade stall condition.

How to Recover from Blade Stall

The best advice is: don't get into this condition especially in a dive—prevention is still better than the cure.

Assuming that you inadvertently encounter retreating blade stall and are able to recognize the characteristics from your study of the flight manual for that particular model, recovery may be effected by:

- Decreasing load factor.
- Slowing down.
- Increasing rotor speed.

If blade stall is encountered in a banked turn for example, decrease collective, relieve some aft cyclic pressure and decrease the bank angle. These can be done almost simultaneously and as the collective is decreased, the rotor RPM on most helicopters is automatically increased. Abrupt control movements tend to aggravate blade stall and should be avoided.

Forward cyclic should not be used on single rotor helicopters which have a nose rising characteristic. The UH-2A helicopter, for example, generally requires a 10-kt decrease in airspeed before all vibrations are damped out once stall is encountered.

Blade stall characteristics of a tandem helicopter generally are easier to contend with since both rotors do not stall simultaneously and longitudinal control power is greater.

How to Avoid Blade Stall

Blade stall can best be avoided by adhering to published flight envelopes. Avoid maneuvering at bank angles in excess of 30 degrees within 20 kts of the established level flight maximum airspeed. Blade stall occurs with less and less load factor up to the maximum airspeed as shown by the dashed line in Figure 2.

It is in this area of the envelope where blade stall can be entered inadvertently due to gusts and turbulence. Whenever turbulence is known or suspected, reduce flight speed to prevent deep penetrations due to sudden gusts. The severity of gusts cannot be predicted but an indication can be obtained from the aerologist. Safety of the flight will depend on your judgment as the pilot.

Short Snorts

Inventory Control

It was a springlike day when the inboard port 20mm gun of an A-1H underwent repairs. The next day, after three successful weapons delivery flights, a pilot was preparing for a bomb/rocket flight.

The wings were folded to allow ordnancemen to wind ammunition into the guns. While loading, the ordnance crew spotted a screwdriver in the wing stub. Checking further he found a 3-inch dent in the skin in the lower surface of the wing stub, just forward of the flap.

During repairs the previous day, the tool had been lost or forgotten and when the wings were folded it was pressed through the skin by the wing fold arm and knuckle.

The Obvious, Overlooked

With nose gear damaged from an attempted night carrier landing, the pilot of an A-3B was preparing to make a short field arrestment at the secondary divert field.

He had asked the tower where the short field gear was located and the tower replied, "1000 feet from the approach end. It is well lit by a flashing red arrow." Not mentioned was the fact that the first 1200 feet of runway was considered unusable and marked with red lights.

The lighting situation for this runway presented considerable confusion to the transient pilot and as the pilot commenced final approach he lost sight of the illuminated sign indicating the position of the arresting gear due to the confusion presented by highway and industrial lights near the approach end.

Touchdown was 800 feet beyond the beginning of the hard surface but 1200 feet short of the arresting gear. The nose had to be lowered to the runway prior to reaching the crossdeck pendant.

It was doubted by the investigating board that failure to engage the arresting gear resulted in any significant increase in the damage to the aircraft. However, the mixup is not particularly complimentary.

Briefing prior to the carrier launch did include all possible bingo fields in the operating area but did not include the runway restriction. The approach plate did mention that the first 1200 feet of runway was unusable.

Green threshold lights marked the beginning of the usable runway and while the tower operator was essentially correct in his information, a change in phraseology was considered necessary. To eliminate possible confusion it is now: "The short arrest gear is located 1000 feet beyond the mirror."

Flight Hazard

An F-4B was being catapulted when, under the acceleration load of the shot, the pilot's radar scope came loose from its mountings and struck the pilot in the chest.

Although almost unconscious from the blow, the pilot managed to move the scope and recover from a near stalled, nose high,

sixty degree right roll. He diverted ashore without further incident.

Two retaining bolts had not been installed in the scope after routine maintenance. The scope weighs over 40 pounds and represents an almost lethal object when freed during a cat shot. A night cat shot would probably have resulted in the *loss* of an aircraft. The pilot, in his semiconscious state, could not see his instruments and had only a dim impression of the horizon.

What About Windsocks?

Are windsocks in the vicinity of the touchdown area necessary or needless? It would be logical to assume that two-way radio communication with the tower has made wind indicators obsolete. However, there are scattered opinions, running from heavy attack down to light attack, that the windsock is not dead.

One sample opinion came out after an A-4 swerved off the runway and ended up with a bloody nose: "All pilots should have the best and most accurate wind information available upon landing. Pilots with a radio failure should have a positive method to determine the relative wind on the landing runway. This is especially true in the A-4 aircraft. . . . It is recommended that windsocks be placed at the approach end of all runways. . . ."

That Critter From the Black Lagoon Been Here?

Nope, the nose wheel of a P-2H began a violent oscillation on takeoff. At 80 knots the PPC aborted the run.

Jets were shut down but no reverse thrust was used during the stop. Nosewheel tire marks extended for about the last 2500 feet of roll.

Although the procedure of keeping the weight off the nose wheel was successful, the squadron wondered which is best procedure: To minimize the weight on the nose wheel and slow down gradually or to use propeller reversing and stop quickly? The latter procedure increases the nose wheel loading but decreases time to stop. Will the oscillation (with resulting airframe vibration) be dampened by the addition of weight on the nose wheel? As it was, the vibration caused the pilot's and copilot's instrument panels to be knocked off their mounts.

Near Miss

Autumn 1963
VFR Weather

- 1816—NAS alerted the local DF-radar net reporting an F-4B low on fuel, 169 miles out. NAS helicopter alerted. Nearby USCG helo diverted in direction of jet.
- 1823—Six stations on DF-radar net supplied bearings.
- 1826—NAS in firm radar contact with aircraft, 111 miles out. Pilot reported 12 minutes fuel remaining. Coast Guard stations along the beach alerted.
- 1829—Air Defense Sector diverted an airborne T-33 for intercept.
- 1837—T-33 completed visual intercept 37 miles out.
- 1839—NAS search and rescue helicopter airborne.
- 1845—F-4B landed straight-in and *flamed out on touchdown.*

System Safety

Engineering

Specifications

What is the purpose of a Design Safety Specification? To provide a better system to avoid repetition of oversights in design which have led to accidents or potentially serious accidents in the operation and maintenance of aircraft. Safety in design should be inherent in the attitude of every engineer and part of his ethical responsibilities to the profession.

By CDR D.M. Layton,

NASC

It has been said that "Safety is no accident." In addition to being a self-definitive phrase, there are implications here that intentional activity can produce safety. Nowhere is this truer than in the field of aircraft design.

The days of laying out plans for the "Spirit of St. Louis" in a loft over the factory or the building of an airplane in an abandoned church without ever having seen a plane before—those days are lost in these times of mass production, automation, complex electronics and super-mach flying. The number of designers, engineers, draftsmen and testers that are required before the first rivet is placed is staggering to the imagination. And somewhere along the line there must be made determinations that this plane *can* be built, that it *can* take off and land, that it *can* perform the required mission, and that it can do these functions *safely*. Where is a better place to exercise "Safety First" than first? Aircraft safety must begin with initial design.

Since the designers are human and since to err is human, it follows that without adequate safeguards some error will creep into design. Once an individual designer is made properly aware of a fault in his design, he will take personal steps to prevent its repetition. But in an aircraft factory it is increasingly difficult to spread this awareness throughout the design section. And it is even more difficult to pass this information throughout the industry. For this reason we are plagued with design errors that repeat from one generation of equipment to the next and that repeat from contractor to contractor.

The Ballistic Systems Division of the U. S. Air Force, in an effort to place increased emphasis on the contractor's safety effort, originated a proposed Design Safety Specification. This document was inserted under the technical title of an exhibit into several ballistic systems contracts. This document spelled out a standard minimum safety effort for the contractor including hazard analysis and classification.

With this paper as a basis, the Naval Aviation Safety Center commenced work on a similar requirement for aircraft. Inasmuch as the contract safety effort concept was becoming known as system safety engineering, the Navy proposal took this as its title. First, public discussion of this proposal was held at the 1963 Navy-Contractors Aviation Safety Representatives Conference held at the Naval Aviation Safety Center in May 1963. Here a representative group of the Safety Panel of the Flight Opera-

tions Committee of the Aerospace Industries Association of America, Inc. reviewed the first draft and proposed some modifications.

A second draft was forwarded to the AIA for industry comment and a third draft that contained all of the AIA recommendations was presented to the Chief of Naval Operations in September 1963.

In the meantime, the Air Force Systems Command, using the Ballistic Systems Division exhibit and the Navy proposal, generated an Air Force Specification proposal which after discussions between the Systems Command, the Logistics Command, and the Directorate of Aerospace Safety was approved as a U. S. Air Force Specification (Mil S-38130 USAF).

This specification varies only in a minor degree from the Navy proposal and so it has been proposed that a joint Aeronautical Standards Group (ASG) document be issued. This proposal is currently in the ASG office (a joint Air Force-Navy-Society of Automotive Engineers Standards group function).

The U. S. Army, which is affected from the Navy and Air Force procurement angle, has had inputs into the proposal of both services.

Now, what is this specification, what does it require, and what are the desired results?

This specification is a formal statement of the requirements to be met by the contractor to engineer safety into weapon system design and operation.

The specification establishes general requirements for applying safety engineering principles throughout the design, engineering production, test, and operational phases of the aircraft. The contractor is required to identify his safety organization and to establish a System Safety Engineering Plan (SSEP) which will set up the requirements for monitoring, testing, analyzing and reporting. The ultimate goal is to design out safety hazards, but where this is impossible or impractical the contractor is charged with minimizing the hazard and providing safety and/or warning devices.

In order to establish a reservoir of safety actions, the contractor will maintain records of safety activity. This should at least alleviate the problem of repetitive design errors.

The contractor is also required to carry his safety effort beyond the design stage into fleet operation.

Is this a cure-all? The solution to the high accident rate? Unfortunately, no. This is but another step in the long line of human engineering, reliability, maintainability training, *et al* that we hope will lead us closer and closer to the day of the zero accident rate.

Safety First and Design Safety are synonymous.
(For the lighter side of design safety, see Pelican Parable, page 24—Ed.)

Background and Examples of Design Safety

Q. What are some examples of current design safety requirements and problems?

A. There is a tendency to believe that present efforts to write firm reliability and inspection requirements will also solve the safety problem.

This is only partially true. A part that lasts a million cycles may be highly reliable—but if the "millionth and" one cycle results in catastrophic damage —the item is not safe.

A UH-34 accident occurred on the East Coast (Marines) due to crossed servo hydraulic lines. A UH-34 incident occurred on the West Coast (Navy) due to the same cause. Both happened on the same day!

Support Equipment—Jack points are usually made removable in order to save weight and clean up the design. In order to have the pads available they are often stowed in the aircraft—thereby increasing the weight (increased pad mount weight to permit removal, bolts, and storage bag) plus offering a gear adrift problem. Safety consideration is indirect but mishap potential exists.

Equipment Access (Maintainability)—On one aircraft, the Power Supply requires frequent adjustment or replacement—157 screws on the fuselage side panels have to be removed (and re-installed) to service the unit. The safety of flight connotations are twofold.

a. Due to the workload (15 man-hours) this unit might not be adjusted when needed.

Continued next page

Examples continued

b. If it is, manpower must be taken from some other activity—which could well involve flight safety.

Handle Location—Two Navy jets have (or have had) adjacent Ram Air Turbine and Canopy Jettison handles that are similar in size and shape. Loss of electrical power in one of these aircraft has resulted in 11 jettisoned canopies and a loss of an aircraft. Reliability of both handles is nearly 100%. Safety is 0%.

Constant Speed Drive (CSD) Oil System— The CSD is an auxiliary system, yet is often designed to use the same oil supply as the engine. Contamination of the CSD or a leak in the system affects the oil supply to the engine causing inflight shutdowns or failure.

"CSDs should have an independent oil supply"

"Murphy"—One aircraft manufacturer has stated that he can make an aircraft fool-proof, but not "damn fool-proof." However, continued design effort can, at least, reduce the Murphy possibility. Variant end fittings, separation of lines and tubing, color coding, and physical shape differences are but a few of the anti-Murphy tools available to the designer.

Testing Conditions—One Navy jet has a requirement that the Pilot-Bombardier-Navigator enter the aircraft, start the engines, and then the BN gets out to permit a maintenance man to enter, *stand on the ejection seat,* and make an electrical check of the ejection seat. The electrical check points could have been led out to an external check point.

Single Control Airstart Capability—Some aircraft require the near-simultaneous operation of several levers and switches for an air start. At this time the pilot does not have time for the leisurely flipping of switches.

"All jet aircraft should have single control air start capability"

"It can't happen here."—The manufacturer's spokesman said that dual failure of this system could not occur. Yet it had, as evidenced by the accident. Inasmuch as the designer had felt that dual failure was impossible, no pilot instructions had been prepared to cover such a failure. A design safety specialist, in his role of "Devil's Advocate" would have to inquire "I don't care whether or not it *can't* happen—what occurs when it does happen?"

Repeat Gripes—A Navy jet *had* a landing gear handle that could be in an intermediate position with the gear *either up or down.* The manufacturer's predecessor of this model had the same problem!

Fire Detection Systems—Aircraft and pilots have been lost because the detection system did not give complete coverage. Also, aircraft have been abandoned in flight because of unreliable detection systems which gave false warnings.

"Detection systems must be adequate and reliable"

Not all aviators like to "bend an elbow."— One model ejection seat has a secondary firing handle that requires a pulling/twisting motion, inboard and up. This forces the elbow outboard where it can be hit during the ejection. Making the handle so that it twists outboard would force the elbows in—thereby protecting the 'crazy bone.'

These are but a few of many major and minor design safety problems facing naval aviation. A full list, which is subject to many interpretations, would probably include every model of aircraft, and many vital systems. Some examples include:

- Night Instrument Lighting (Glare on windshields, or intensity variation—some gages light when others dark)
- Aircraft Navigational Equipment (Excessive failure rates)
- UHF/IFF Control Switches Relocation)
- UHF Remote Freq Indicator
- Incipient Engine/Equipment Failure Detection Devices
- Throttle Balance
- Continuous Ignition/Flame-out Sensor
- Brake Systems (Deck Handling Problems)
- Inadequate Windshield Rain Removal Systems
- Underwater Escape
- Inadequate Fuel Tank Pressure & Vent Systems
- Hard Landing Detector
- Fuel Dump Systems
- Zero-Zero Ejection Capability
- Oil Quantity Indication System
- Positive Disconnect of Subsystem (capability to insure positive activation)
- LOX Servicing Fittings in Close Proximity to Fuel Defuel fittings.
- Capability for *visual* check of proper latching of bombs/tanks, etc., on wing racks.

Q. *Is there any publication which chronicles Navy efforts in the maintainability-reliability-design area?*

A. Yes. *THE BIMRAB Reliability Bulletin.* This BuWeps newssheet is the official organ of the BuWeps-Industry Material Reliability Advisory Board and is published quarterly at no cost to the government. Requests for distribution should be addressed to BIMRAB, BuWeps, RAAV-02, Department of the Navy, Washington, D. C. ZIP Code 20360.

Q. What are some precepts of good design?

A. The following, borrowed with permission from the FSF Design Notes files, summarizes eight rather basic design points. These have been distilled from a number of reports and important documents and magazines published by both military and the industry. These are:

Precepts of Good Design

Fail Safe—Parts or components of the aircraft other than the basic structure should be designed so that if they fail, they fail without catastrophic results.

Rough Handling; Impact—The structure and its components should be designed to encounter with safety the impact of objects, the rough handling by men and the effects of natural phenomena which are likely to be met in service.

Average Human Performance—The procedures for adequate maintenance and operating practices established by the designer should be consistent with average human effort, ability and attitude.

Human Error—The aircraft and its components should be protected against the effects of normally inadvertent or uncontrollable human errors.

Deflections and Wear—The structure and its components should be compatible—one part with the other—from the standpoint of durability, deflections, wear, and the danger of one creating a hazard by proximity to other parts.

Environment, Dust, Vibration—The structure and its components, especially moving parts, should be protected against the effects of environment likely to be encountered in service such as vibration, dust, great pressure differentials, oil mists, and temperature extremes.

Occupant Protection—The aircraft should be designed to give the occupants reasonable assurance of protection in accidents which are considered to be survivable.

Reliability—The structure and its components should be designed to provide optimum reliability for the estimated time between overhaul of each part and provision should be made to determine, by inspection or test, reliability between overhauls.

Q. What is the official position of the Naval Aviation Safety Center as regards design safety?

A. The opinion of the Commander, NASC, expressed publicly and at many industry meetings and in extensive correspondence with various Bureaus, can perhaps be summed up best in the following extracts from his actual words to the most recent international air safety seminar conducted by the Flight Safety Foundation at Athens, Greece.

"We must be constantly aware of the fact that safety begins on the drawing board. If it is not designed into an aircraft, no subsequent safety regulations, and no amount of safety measures can ever completely compensate for the vulnerability inherent in the system. . . .

"By insistence upon a vigorous program of safety in design, we can not only reduce the number and severity of aircraft accidents, but we can improve cost effectiveness at the same time. Too often, safety deficiencies that should have been discovered and eliminated in the concept, design or test phases, have not been discovered until after the aircraft is operational.

"There are many reasons why we do not now get coordinated safety engineering into aircraft design. Contractors can list a host of reasons, among them being: Lack of adequate specifications, procurement policies, sub-contracted equipment, etc.

"There is a tendency to believe that present efforts to write firm reliability and inspection requirements into contracts will solve many of these problems. I want to add my support to these efforts, because reliability requirements are paying dividends already, notably in the avionics field. But more severe reliability requirements alone will not serve to insure design safety. The difficult problem, of how much reliability is enough for safety in critical systems, is the province of safety systems engineering. Not only will safety systems engineering pay its own way but it may well serve as a lever to get reliability engineering up on both feet.

"The real question is whether or not we can expend the effort to get it. The U. S. Naval Aviation Safety Center is making a move to get design safety off top-dead-center. We are proposing requirements for aircraft systems safety engineering in a form suitable for inclusion in the general aircraft specification. . . ."

troubles troubles troubles

Anymouse Special

I departed an East Coast air station on a routine IFR flight to East Coast air station Y in an A-1E. My mission was to pick up some badly needed AOCP parts for the blowtorches we had just received aboard. The weather was predicted VFR all the way but I filed IFR just in case.

The first of a series of unusual incidents occurred right after takeoff when I couldn't contact departure control. After attempting to contact everybody and his brother, I finally managed to get, of all people, ground control. The UHF wasn't cycling properly and it wouldn't respond to manual tuning. Since the sun was shining brightly I cancelled the IFR portion of my flight plan and stated I would proceed VFR.

About 30 minutes from destination, I observed a line of very menacing looking clouds stretched across my flight path and upon finding them impossible to penetrate VFR I executed a 180 and proceeded back to home plate.

Upon my arrival I still had two hours of fuel and when a reassuring voice answered my call (ground control again) it appeared that the end of a rather unpleasant flight was in sight. This vision was quickly shattered, however, when the wind report revealed a 30-knot gusty crosswind. I attempted one pass at the field's only runway just to be sure the wind gear was calibrated properly and it became immediately evident that landing a conventional gear single engine aircraft in these conditions was impossible. I waved off and relayed my intentions to proceed to and land at air station Z which was only 15 minutes away and VFR. An un-

eventful landing was accomplished and after smoking it over I decided to RON, get my radio repaired and take another shot at air station Y in the morning.

Early the next morning I buzzed into aerology and received a weather brief which predicted a completely VFR flight. I indicated that although I was sure the aerology profession was an honorable one, I hadn't imagined the weather the day before and the fact that the duty aerologist discounted my observation as merely a local condition disturbed me. After absolute assurance that nothing even approaching IFR conditions would exist on my planned flight path I begrudgingly filed VFR.

I rationalized filing VFR by the following line of reason. If the radio goes haywire after takeoff again, there I'll be on an IFR clearance with no radio. The weather here is good VFR so by filing VFR I can test hop the radio before departing the area and if everything goes OK with the radio and I should encounter IFR conditions along the route I could always refile in the air. If the radio doesn't check out, the tower would be alerted to this possibility and landing by light system would be a simple matter.

I launched at 0900 and since the radio checked out fine, I continued on toward air station Y. This time I reached a point about 25 minutes out when it became obvious that the weather was beginning to deteriorate rapidly. The ceiling went from high overcast to about 2500 feet in less than 10 minutes. I called Y tower, informed them I was inbound and requested their present weather. They responded with all the usual dope and stated their weather was high thin overcast with eight miles visibility. Well, this sounded great but my Mark-1 eyeball just wouldn't confirm such optimism. I was now chugging along at 1500 feet just under the overcast with forward visibility barely three miles. I suddenly got that 180-degree feeling again even though I could hear the boys shooting FCLPs and other aircraft in the VFR pattern. My tacan showed 12 miles but I just didn't feel VFR, now at 1000 feet completely surrounded by scud, with forward, sideward and backward visibility reduced to — well, let's just say it "weren't good."

One hundred and eighty degrees later I informed Y tower that I had encountered IFR conditions 12 miles northwest of the field and was presently holding VFR over Podunk omni (about 30 miles northwest) and was requesting IFR clearance direct to Y airport with a GCA pickup. They answered by repeating the weather as high thin overcast eight miles visibility. By this time I was beginning to wonder if maybe I had entered the twilight zone.

I reaffirmed my intentions in such a positive manner that the tower immediately issued instructions to switch to feeder control for further clearance. I gave feeder control the whole story again and a rather excited voice came back with the following instructions: "Depart Podunk Omni on heading 0-30 degrees maintain 1500 ft. Will coordinate with thump-tiump center." I tooled around, making this turn and that (under positive radar control), until a clearance was obtained and I was vectored to intercept the downwind leg of the GCA pattern. I had been on actual instruments. now ever since leaving Podunk omni. At 7½ miles on the tacan I broke out into gorgeous VFR conditions and there in all its splendor was the beautiful panorama of air station Y. I called radar and informed them that I was now solid VFR and if it would expedite other IFR traffic I would cancel and land VFR. They said that such a move would be greatly appreciated and cleared me back to tower frequency.

I entered downwind as instructed, lowered the gear and at the 180 began a normal approach to what promised to be a normal landing. The "gods of uneventfullness" were just not tuned in on my frequency for when I turned final, ye old cockpit filled with smoke and once again I was IFR. I immediately

declared an emergency and requested a fire truck to stand by. On the last portion of my final, I transmitted my intentions. I would land and on the rollout secure all electrical equipment being sure to clear the duty before shutting down. This was accomplished without a hitch and I thought to myself as I crawled out of a smoky cockpit, "what a helluva way to spend my day off."

I turned in my flight plan to base ops and since nobody seemed especially interested in my rather unorthodox arrival I proceeded to look for the parts I was to pick up. It became necessary to RON again due to the aircraft being down and the unavailability of the parts for which I had traveled so far.

Early the next morning as I was calling for transportation to supply, I noticed a note posted at the desk directing me to call the Base Ops office. I did and was asked to report directly to the office, no explanation. Upon arrival I was greeted by a gathering of the clan. There was the Ops Officer, base safety officer, RATTC officer and tower supervisor. Yours truly completed the list.

The Ops Officer brought the meeting to order and commenced a third-degree barrage of questions directed at me. He wanted to know why I was holding over Podunk omni IFR on a VFR clearance. I answered that I had informed feeder control that I was holding VFR over Podunk requesting an IFR clearance. The ops officer asked the RATTC officer if the tape confirmed this. RATTC said the tape was garbled at this point. He had thought I had said I was IFR over Podunk. The tower supervisor said his tape confirmed *my* story when I contacted him initially. The ops officer then asked me why I had filed a VFR flight plan in the first place. I pointed to the crumpled copy of my DD-175 laying on his desk and stated that aerological information indicated that it was entirely feasible to do so. At this point I began to wonder what it was all about when the base safety officer cleared up the mystery by addressing our distinguished group.

"Gentlemen," he said, "two jet aircraft landed here yesterday with 400 and 600 lbs of fuel respectively. This was due in its entirety to a hold-up of some 20 minutes past their expected approach time. The reason for this hold-up seems to be one A-1E. This A-1E was given priority over the jets when he requested an IFR clearance and the subsequent emergency encountered by the A-1E resulted in the field being closed for 10 minutes. If proper procedure had been followed the jets would have been cleared in first and this unfortunate and dangerous situation could have been avoided."

RATTC answered this by professing his concern over a wayward A-1E floundering around a busy airway IFR. He felt his most pressing job was to get the A-1E a clearance before the situation took a turn for the worst.

I expressed surprise that the field was closed for 10 minutes after my landing as I had made it a point to clear the duty runway before shutting down. It was then, RATTC and tower confessed to a breakdown in communications. It turned out that the tower had never really closed the field but didn't get the word to RATTC that my emergency was well in hand and approaches could be commenced.

It appeared that two very expensive jet fighters and two irreplaceable pilots were almost lost due to a number of events and misunderstandings that when blended together added up to a serious accident potential.

The ops officer dismissed me with a clean bill of health and even apologized for the inconvenience. I have subsequently rehashed the complete mess and these are my conclusions:

After takeoff from home plate and upon discovering that my radio was not functioning properly the obvious thing to do was return and land.

I then defied my better judgment by not filing an IFR flight plan the following day.

I'm sure my decision to execute a 180 when I could no longer maintain VFR was sound, but it might have been possible to figure out that a misunderstanding had taken place between feeder control and myself when I was directed to leave Podunk omni and was vectored all over creation before receiving an IFR clearance.

After breaking out into VFR conditions near the field, the subsequent approach and emergency was of course one of those unexpected things, but it was obvious that if the word had been properly passed the jets could have been cleared almost immediately after I landed.

This is once again a perfect example of how a number of small seemingly unrelated incidents can mushroom into a major hazard that many times ends up being second-guessed by the AAR boys instead of the Anymousers.

The VFR End Of It

It was number five flight of the day and a night one. The weather at destination and enroute was forecasted CAVU, with the exception of thunderstorms along the first 50 miles of the route. Up to this point Omni and ADF had been working as advertised so an IFR flight was waived because of an expected delay. With flight planning completed, navigation charts out, and night equipment checked, a VFR departure was made into the blue (rather, black).

Shortly after takeoff, climbing to 23,500 feet, heading was altered to the right 80 degrees to avoid thunderstorms. This change of course was held for approximately 12 minutes at which time a 40-degree turn was made in an attempt to intercept the planned route. Heading was held for an additional 15 minutes expecting all the time to pass by the thunderstorm activity and resume normal navigation. But looming up ahead were blinding thunder bumpers to no end. A further deviation to the right was required. Between manipulating the flashlight, three navigation charts and two "coffee grinder" type NavAids, a known position was difficult to maintain; in fact, it wasn't.

By this time it was quite obvious that a CAVU flight was only a dream and that thunderstorm activity could not be circumnavigated. The question now was not

whether to return and land, but where to land. With NavAids unreliable and 4000 pounds of fuel remaining, it was high time to swallow a little pride and make a confession—that my exact position was unknown. Hell, I was *lost*.

A call for HELP on 255.4 was acknowledged by two or three radio stations and it was only a matter of minutes until a UHF/DF steer was given. With no SIF gear aboard, additional time was required for the Area ARTC Center to pickup a positive radar fix. After a clearance to altitude to conserve fuel, and a few turns and frequency changes, an uneventful radar approach to a landing was made at an Air Force base within 50 miles of our departure point. The recovery required 2000 pounds of fuel.

Next time it's *radar* from the ground up for me!

Brief Them All

Not long ago, a successful ASW brief had been completed with all members present except my first crewman. The mission was VECTAC, the aircraft an SH-3A. As this crewman was an old hand in the outfit, it did not seem necessary to go through the previous brief.

In these types of deliveries there are two critical timing periods. The first one is an allotted time from the start of run until on top the controlling helo, the second being the run out distance in seconds to the drop position.

Our bird uses the N3N type of smoke launchers, strictly manual. Our crewman being an old salt, was in a position in the after station, smoke in hand well before the appointed minutes to insure

ANYMOUSE

The purpose of Anymouse (anonymous) Reports is to help prevent or overcome dangerous situations. They are submitted by Naval and Marine Corps aviation personnel who have had hazardous or unsafe aviation experiences. As the name indicates these reports need not be signed. Forms for writing Anymouse Reports and mailing envelopes are available in readyrooms and line shacks. All reports are considered for appropriate action.

—REPORT AN INCIDENT, PREVENT AN ACCIDENT—

that our crew would do well, since this was a competitive exercise. All was in smooth order as we started our run-in and the copilot was counting the seconds to go until on top of the controlling helo. "Three-two-one-on top." Well you guessed it, from the after hatch dropped an eight pound smoke light bound for the spinning blades of our hovering friend.

Fortunately, we were about two seconds slow so the smoke light missed the rotor blades by about six yards. It was impossible for the controlling helo to move out of the way and what was a close call could have been disastrous to four people and one helo. Needless to say, our crewmen now get the most complete brief of any crew in the squadron.

After-Burner

As I slipped behind the steering wheel of my car, this morning, I lightly grazed the wheel with one of my trouser pockets. About the time I was comfortably nestling in the bucket seat, all hell had broken loose! Much smoke—more concern—and an irrespressable desire to get the hell out of there. Believe me—if I'd had an ejection seat in the car—I would probably have used it.

Close inspection after the incident revealed that two packs of safety matches had caused all the ruckus. Seems that one pack had slipped under the cover of the other. Since the striking surface of one pack was against the matches of the other, all it took was a slight bump to set them off.

Since the car wasn't moving, I was able to jump out and extinguish the fire with little difficulty. Had I been driving down the road—or in an airplane at angels 10, perhaps the outcome would have been much different. How many packs of "safety" matches do you carry in a pocket? I now carry only one.

SINGED MOUSE

A Tanker Tail

My late afternoon launch in an A-4 "tanker" from the deployed WestPac CVA went as scheduled. A night recovery was to follow a flight duration of 1 plus 40. Following the launch the buddy store was checked by another A-4 with normal operation in all respects. The flight was completely routine until shortly before landing.

Just prior to commencing an approach from 5000 feet, a flight of A-4s joined for practice plug-ins. Shortly thereafter I was told to dump what excess fuel I had and was given vectors to feed into the CCA pattern. The flight of A-4s departed prior to my retracting the drogue, but I feel certain I engaged the RETRACT switch on the store control box. However, due to preoccupation with the vectors and letdown instructions, and complete instrument conditions, I can't recall checking for the RET indication on the control box.

Due to a heavy bolter rate my entry into the CCA final was delayed, and by the time I reached the glide slope for my first pass I had only 1600 pounds of fuel. As I crossed the ramp I experienced a violent jolt, and boltered. The LSO advised me that the hose was extended and the basket had hit the ramp, broken off, and had come to rest on the flight deck. He advised me to reel in the hose which I attempted to do, but the control box indicated TRA (transfer) position.

After another extended downwind leg and entry on to final, with 900 pounds of fuel remaining, a normal landing was made with no damage to store or aircraft. The aircraft received no damage from the incident. I did not attempt to jettison the hose, which is the NATOPS recommended procedure, as I was con-

cerned with flying the aircraft. Also, my fuel state was approaching a serious level.

The CAW refueling doctrine requires that following plug-ins the receiving aircraft will ensure that the store is secured prior to departing (if there is no tanker escort). Had they done so, this would not have occurred. However, it is imperative that the tanker pilot doublecheck all switches for proper position and indication, and to know the exact condition of the store at all times.

Lightning Strike

On 6 May an A-4B was returning from a navigation flight to NAS Lemoore. The conditions were as follows: Gear and flaps up, 210 KIAS, 4000 feet MSL, starboard turn in heavy precipitation from a thunderstorm. Lightning in the form of a small but intense white flash was observed to hit the refueling probe of the aircraft. At this time a loud report and heavy pressure was felt on the pilot's chest. All radio and nav equipment was working prior to the strike and continued to operate after the incident.

The aircraft was tested for airworthiness and no abnormal indications were found. The magnetic compass was badly magnetized and most inaccurate. Upon landing three small marks, similar to high voltage arc marks, were found at the 9 o'clock position of the refueling probe aft of the nozzle.

In addition, the aircraft was magnetized to the extent that even replacing the compass components did not offer satisfactory heading information. No other damage was noted. The aircraft required O&R degaussing before it could be returned to service.

Casey Jones

During a recent landing at a major naval air station, a transport received a magnetic chip detector warning light from the port engine. After taxiing to the line and shutdown, the plane captain removed and examined the sump plug. This was done only upon prompting of the plane captain by a passenger who was well qualified in maintenance procedures.

Considerable steel chips were found on the plug—including a chip which exceeded the maximum tolerable limit. Since the plane captain was not versed in the limits of GREB 165, the passenger advised the plane commander of the seriousness of the situation.

After a hurried telephone conversation with his home base, the plane commander returned to the airplane. He stated that since the Admiral aboard had to get to base X, to put the plane back together and they'd "give it a try." The plug was wiped off and reinstalled.

The night takeoff and 300 miles to base X was without incident except that the starboard propeller was stuck in reverse after landing. After discharging the Admiral, another phone conversation with home base and "unsticking" the starboard propeller, the aircraft was flown back to the VR squadron home base. Another aircraft took the remaining passengers and cargo to the final destination while the "dud" was being repaired.

This incident again illustrates a case of expediency overriding sound judgment and good operating procedure. Secondly, it was painfully apparent that there was a gross lack of knowledge as to what must be done with an aircraft engine concerning magnetic sump plug warning lights—especially on the part of the plane captain.

Answer to AF-IE NATOPS Exam

Question: If you are at the 90° position on an actual flameout approach, 155 knots, and are going to land short, how may you extend glide?

Answer: Eject, it lightens the aircraft and complies with NATOPS also.

—VR(F)-31

Have you a question? Send it to
U. S. Naval Aviation Safety Center,
Norfolk 11, Virginia.
He'll do his best to help.

HEADMOUSE

Damaged PRC-32s

Fig. 1

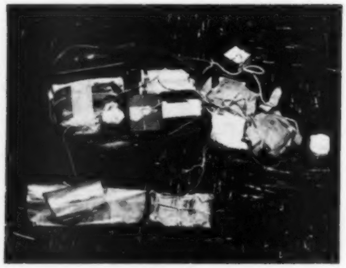


Fig. 2

Dear Headmouse:

On two recent ejections in the squadron it was found that the PRC-32 radio transceiver was damaged by the seat emergency oxygen bottle during ejection acceleration. In both cases the transceiver, although usable, was damaged and the actuating buttons were difficult to operate. Figure 1 is a photograph of the bailout container packing which resulted in damage to the PRC-32. Figure 2 is a photograph of the bailout container packing which prevents the emergency oxygen bottle from striking the transceiver should the ejection seat be utilized.

In view of the prime importance of this equipment to pilot rescue and because of the fact that there are no standardized packing instructions for the highspeed bailout container, it is recommended that this information be disseminated to all squadrons utilizing this survival pack.

T. L. NEILSON
CO VA-72

▶ Records at the Safety Center indicate two cases of damaged PRC-32 radios during the period 1 Jan 62 through 31 March 63. It is believed that the lack of more reports of damaged radios is probably due to these sets having been packed in various random positions which precluded impact with the emergency oxygen bottle. The Safety Center has recommended to BuWeps that a standardized, approved packing method be devised.

Very resp'y,

Headmouse

Orange Summer Flight Suits

Dear Headmouse:

It seems that the summer flight suits bearing contract number DA-36-243-QM (GTM)-10975-C-62 are decidedly substandard, both in fit and quality. The average suit lasts for one month and two washings. Various inadequacies, such as weak and poor-working zippers, poor sewing, and material durability could be improved on, I feel.

We are now spending an average of four man-hours a day simply repairing flight suits in order to stay within our budget of $1500 per month. We replace zippers and patch "patches" on suits a month old or less, especially in the case of the zippers.

My recommendations along this line would include: (1) Heavier zippers, as on the older tan and orange suits with buttons on the waist belt. (Incidentally, we prefer the buttons as opposed to the nifty belts which grow ineffective with age); (2) A double seat and a doubler along the thigh to sew a survival knife sheath upon; (3) Change the color back to tan, as most people have so much gear on over the suit that orange suits show orange only for about two square feet at one time.

I personally have one of the "old" suits. It's going on three years old, and it's still in good shape. I wouldn't trade it in for anything we're getting nowadays.

ENS EDWARD B. OLIVER, JR.
ASO, PATRON 47

▶ BuWeps advised the Defense Clothing and Textile Office of these deficiencies. Two contracts were involved. Other contracts have been acceptable. What can you do? Don't accept a suit with the contract number you cite.

Also, ensure that a FUR is submitted on faulty flight suits or any unacceptable aviator's equipment. Cognizant Bureaus must have documentation of unsatisfactory equipment in order to make improvements.

There is a new Mil Spec requiring heavy, more durable zippers.

Very resp'y,

Headmouse

Sunglasses

Dear Headmouse:

I have heard a rumor that sunglass distortion can cause accidents in take-offs and landings. What does the Safety Center think?

SAFETY OFFICER

▶ No ophthalmologists are assigned to the Safety Center. However, this matter has been discussed with both ophthalmologists and optometrists having considerable aviation experience and it is their opinion that the "plano-plano" lenses of standard Navy issue sunglasses should not affect depth perception. Records at the Safety Center indicate that there have been no accidents wherein sunglasses have been listed as a causal factor.

If an aviator feels his glasses are distorting his vision in any phase of flight, he should consult his flight surgeon to determine the amount and effect of such distortion.

Very resp'y,

Headmouse

Braking Technique

Dear Headmouse:

On S-2 aircraft, would brake wear be substantially increased by using the brakes hard for a short period immediately after touchdown and thereby having positive control of the aircraft as opposed to pumping intermittently over a more extended period resulting in increased taxi distance?

ANYMOUSE

▶ Brake wear would be substantially increased by any braking immediately after touchdown. The best way to stop the S-2 under normal circumstances is to use aerodynamic braking to about 50 knots followed by intermittent or heavy braking as dictated by runway remaining.

Stoof brakes (except D and E models) are notoriously susceptible to overheat and fade, so excessive use or hot rod taxiing should be avoided.

Very resp'y,

Headmouse

Abbreviated GAR

Dear Headmouse,

I have noticed that some squadrons utilize the abbreviated ground accident report form when an accident occurs to their aircraft for which they assign facilities part of the responsibility.

On this form, there is no provision for a via addressee, therefore, no opportunity for the activity involved to comment. We do get a copy but have no way of stating our opinions on the accident.

I recommend that a change be issued to OpNav Inst. 3750.6E restricting the abbreviated ground accident report form from being used when another activity's personnel or facilities are involved.

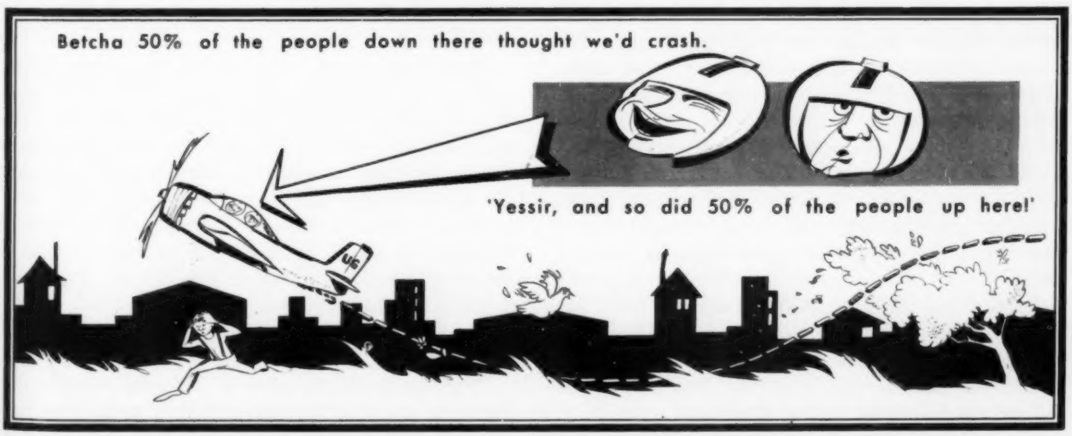
DEPRIVED MOUSE

▶ There is no need for a change to the instruction in this regard.

Upon receipt of a ground accident report, assigning facilities part of the responsibility, the commanding officer must initiate a letter to NASC commenting on each factor involving his command. Send a copy of the letter to all commands receiving the original report. When received by the Center it will be associated with the appropriate mishap report and treated as part and parcel of the whole occurrence.

Very resp'y,

Headmouse



Experience keeps a dear school but fools will learn in no other—Ben Franklin

PELICAN PARABLE

All the semi-chiefs in the office of the Director of Fishing were cogitating madly for a manner in which to demonstrate the effectiveness of the newly acquired ability. A more knowledgeable pelican had convinced the Supreme Council that mission accomplishment could be greatly enhanced by modifying some pelican beaks, through a new exercise, to carry a greater payload of fish. This extended range operation added considerable weight to the basic pelican, but it would be worth it. Eliminate the sand bar hopping and RONs and the fish would be delivered to destination in a much fresher condition.

As one of the officials worked his way through the clam shells which had accumulated in his in-basket, he suddenly called for attention.

"Aaaaawk!" he said, "here's the answer."

"Our friends from the Albatross Fishing Command want our help in investigating their mid-ocean fishing grounds. They haven't used them for the past 20 years or so because of the great distances involved in returning the fish. Now they have learned of our extended beak for long range operation and would like us to sample the old area for them."

A great chorus of aaaaawks filled the room. All the Fishery Department pelicans thought this a marvelous way to demonstrate the new capability. Only one pelican, the one responsible for fishing safety, was doubtful. "But we haven't actually tried this extended beak under field conditions. No one has flown with a full beak. Shouldn't we suggest a safer method of helping the Albatrosses than to take our brand new equipment into a fishery ground that we know nothing about?"

"Nonsense," they replied in unison. "We can make it. And, aaaaawk, to prove it to you we'll conduct a test of the new beak here at home, under the same conditions we may expect to find at the Albatross fishing grounds."

For days the plans were carefully laid out and finally a small fishing area was located over in the next harbor that pretty well matched that described by the Albatross Fishing Command. After examining records, Waldo, a bright young pelican, was selected for the test. He was strong — fresh from the nest, his feathers glistening, and his newly modified beak a beautiful sight to behold. After a careful briefing. Waldo gave a small "aaaaawk" and departed for the test area where all the fishery dignitaries were gathered to observe.

Waldo performed superbly! He made dive after dive, filling his extended range beak with more fish than one would have thought possible. "I'm afraid he may be too heavy to make a landing in those shallows," warned the fishing safety pelican. No one listened.

Finally, Waldo had a beak full and, as briefed, he applied MAX power and pulled up into a standard traffic pattern, then let down for a landing in the shallows. Raising barely a ripple, he made a perfect touchdown and runout, and then he sank.

The water simply couldn't hold his weight and there he sat, only the magnificent beak full of fish above the water.

"Aaaaawk," said the safety pelican with a sigh. "I'm certainly glad you gentlemen consented to

this test. Now we know that certain areas cannot accommodate our extended beak model."

"Aaaaawk, possibly, aaaaawk," they replied. "But more likely it was a combination of Waldo's relative inexperience with the extended beak and an unusually poor fishing shallow on which to land. The Albatross mid-ocean area couldn't possibly be that bad."

"You mean you intend to go ahead with that project?" The safety pelican couldn't believe his ears. "Wouldn't it be better to ask the Albatrosses to float out there on a load of flotsam or jetsam?"

"Aaaaawk, don't be silly," they replied, "In the first place we know we can accomplish this mission, and in the second place there is a time factor to consider. It would take too long to boat out there. Besides, think of the recognition we'll get for this operation. If our man gets out there and finds the shallows aren't right for a landing, he can turn around and fly all the way back. It will prove the justification of our modification and the entire extended beak theory."

The fishing safety pelican was out-aaaaawked. He could do no more. Soon the plans were completed for the mid-ocean fishery project. The Albatross Command was very happy. They thought the pelicans were most generous to assist them. Finally, all was in readiness and another young pelican, fresh off the beak modification line, was selected for the mission. He was thoroughly inspected for the proper amount of oil under his feathers, a well digested meal of imported blue mussels and, of course, a current Form 48 in his Deep Six file. He understood his instructions, was aware of what had happened to Waldo and was ready to go.

He departed on schedule and flew for three days, finally arriving over the Albatross mid-ocean fishing area right on his filed ETA. He looked the area over carefully, calculated his tangibles, ran all the proper check lists, decided he could safely accomplish the mission, and peeled off into his first dive.

Aaaaawk, he thought to himself, the Albatross boys sure knew what they were talking about! The fishing was excellent and shortly his newly extended beak was completely stuffed. He pulled up in a beautifully executed chandelle. His stuffed beak was beginning to weigh him down, but he adjusted his power setting and carefully examined the landing area in the shallows. Employing all his ability as a professional Pelican Fishmission Commander, he flew a perfect approach. He crossed the barrier reef exactly at V_3, reduced power slightly as he flared, and greased it on. The runout was pretty rough, but tolerable, and he knew the tired satisfaction of mission accomplishment.

Then he sank and, like Waldo, squatted on the shoal. Finally, he could no longer hold the extended beak full of fish above the water. It sagged open and half his load flopped out and swam away. After a while he signaled a passing Gooney Bird which in turn relayed a message to Pelican Headquarters that the first extended range mission had been something less than a complete success.

In the big conference room the Supreme Pelican listened to the last of the explanations. He looked around him at the semi-chiefs from the Fishing Department who no longer were so exuberant. He looked at the fishing safety pelican who, as yet, hadn't said a word. In his judgment, these pelicans normally were hard working and dependable. Fortunately, neither incident had resulted in injuries. He decided that his subordinates had learned a lesson through bitter experience.

"AAAAAWK," he said with dignity, and left the room. — *"The Log"*

Mud Trap!

After touchdown an A-4B overran the runway, entered a 3-foot-deep pond with power on and buried itself in the mud bottom. The pilot was uninjured. After a sudden rush of mud and water into the cockpit floor area, the apertures sealed slowing the flow to a trickle. Because of the complete darkness the pilot knew he was submerged. He could judge the aircraft's attitude by the level of the mud and water. With his oxygen equipment performing satisfactorily, he had no trouble breathing.

The pilot's first reaction was to jettison the canopy by pulling the emergency canopy jettison. When this didn't work, he unlocked the canopy manually. Standing on the seat, he tried to force it open with his back and shoulders. He had to take his oxygen mask off because the hose was too short for him to stand with the mask on. He soon began to hyperventilate. Every few minutes he stopped and breathed from his mask. Mud had fouled the inhalation valve preventing normal exhalation through the mask.

At some point during his attempts to open the canopy, he tried to jettison it by pulling the face curtain down to the first notch. He states he was careful not to pull the curtain to its full length lest he fire the seat. There was an explosion but no apparent effect on the canopy. (*Note: The face curtain is not, repeat, is not an alternate canopy release handle. A fatal inadvertent zero-zero ejection has occurred in this aircraft because a pilot attempted to jettison his canopy by using the face curtain.—Ed.*) Finally, fatigued and aware there was nothing he could do, he quietly awaited rescue. Once in a while he moved the stick so that movement of the elevators would show he was still alive. The rescue party rapped on the canopy to indicate work was underway but he did not hear them. He stated later that *if he had had a survival knife* he probably would have attempted to hack his way out.

"Escape from a cockpit buried in mud presents problems not encountered with the usual accident involving an underwater situation," the investigating flight surgeon states. "The following areas concerning this situation seem to warrant some thought and investigation:

"While it is known that most oxygen regulators used in high performance aircraft have underwater capabilities, the question arises as to what their performance would be even if properly utilized in an 'under mud' situation. The importance of keeping the face seal intact under such circumstances is well demonstrated by the manner in which the pilot allowed his inhalation valve to become fouled.

"The wisdom of opening the canopy under such circumstances is questioned, bearing in mind:

- Entry of mud into the cockpit.
- Possible failure of oxygen equipment secondary to mud damage.
- Difficulty of maneuvering to surface through mud.
- Drag produced by bulky clothing and attached gear.
- Limited oxygen supply available once the pilot has switched to bailout bottle. This has been estimated as approximately three minutes under pressure such as was present in this aircraft accident.
- Possibility of imminent rescue from outside help.
- Probability that as long as the aircraft's oxygen supply was available the pilot could safely utilize it, thus allowing time for rescue work to be accomplished.
- Fact that a small hole in the canopy such as could be made with a survival knife will not equalize internal and external cockpit pressures as in an underwater situation."

Rescue operations were hindered in this accident by both the crash crew's lack of knowledge of the location of the A-4B's external emergency canopy jettison handles and by a lack of equipment. A crane was not immediately available because there was no driver assigned; all the qualified drivers were at

Because of complete darkness the pilot knew he was submerged.

the accident scene. A driver was dispatched to bring the crane. In the meantime, two men familiar with the jettison handle positions obtained a shovel and together dug the mud away from the left side. They activated the left handle, then the right handle with no results.

When the crane arrived, the aircraft was raised and the canopy was opened by means of the canopy access handle which was already partially actuated. The pilot was then free.

The investigating flight surgeon estimates that the delay in obtaining the services of the crane added 10 to 15 minutes to the rescue time. Under other circumstances this interval might have been crucial.

A FRIGHTENING EXPERIENCE

An SH-3A departed at 1845 on a scheduled 3.5-hour night training flight. The pilot proceeded to the ASW dipping area where he intended to practice night transitions. The first transition was completed and considered to be normal, but during the second transition the aircraft was not as stable, yet still within operating limits so the pilot continued on to a third transition. This time the aircraft was normal, so a fourth was attempted.

During the fourth transition the aircraft acted unstable again, pitching and rolling, so the pilot decided to discontinue this night ASW training and returned to home field where he joined the GCA pattern. It was now approximately 2000 and the copilot was making the second practice GCA. He reported to the pilot, while on the downwind leg, that his VGI was acting erratic but the OFF flag did not appear; again these erratic movements on the VGI were not of sufficient magnitude to really worry the pilots, so they continued on.

During the fourth GCA the pilots finally decided these intermittent, unstable, and erratic conditions were caused by an unreliable port gyro and switched to the starboard gyro, the port gyro circuit breaker was also pulled. *No more problems*—until the pilot decided to help maintenance by being sure of his problem and do some troubleshooting. This is where his troubles really started. So let's set the scene:

a. On a practice, no-gyro, GCA (night)
b. Port gyro unreliable
c. Port gyro circuit breaker pulled
d. Flying normal with ASE (Automatic Stabilizing Equipment) control box on starboard gyro
e. Switched to port gyro to troubleshoot
f. Got involved with radio calls and heading changes, and forgot about troubleshooting.

The pilots were able to start one more GCA and upon turning on to final (1000 foot altitude) the aircraft suddenly went uncontrollable to such an extent it was necessary to broadcast a "Mayday." The aircraft was pitching up and down, rolling port and starboard up to a maximum of about 40 degrees in all directions. The aircraft was over a populated area and lost altitude to 150 feet above the ground. The pilot was finally able to regain control of his aircraft when he depressed the release button for the ASE. The whole frightening experience lasted only a matter of seconds. At the time of his pullout, the pilot was approaching a parking lot where he expected to crash. With the ASE off the pilot continued to the station and landed without further incident.

Comments

The pilot, after some length of time, finally realized he had trouble and diagnosed it correctly. The ASE control was on the port gyro, which was not only unreliable but slowing down due to the circuit breaker being pulled. The long delay before the uncontrollable condition is attributed to the time it would take the gyro to slow down after all power was cut off. Even though the gyro circuit breaker was pulled the ASE was still getting its signal from the now tumbling port gyro.

Once the pilot was able to realize his trouble and hit the ASE release button on the cyclic stick, the false signals were eliminated from the aircraft flight control system.

NOTE: For the benefit of all non-SH-3A pilots, the Automatic Stablizing Equipment gets its signals from the port gyro and control can be switched to the starboard gyro.

(continued from page 5)

It Still Happens

The culprits are the canopy/ejection seat pins. The pilot had forgotten to pull them. After takeoff, he incorrectly evaluated the vibration from the flapping pin warning banner caught outside the cockpit, as an engine malfunction. During his hasty return to the field he reduced the power to lessen the effects of the "engine vibration" and inadvertently stalled the aircraft at low altitude. Realizing the extremis of the situation, he ordered the passenger to eject. Passenger ejection was successful although serious burns were inflicted when he landed within the flaming debris area.

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HEFOE

North Atlantic Treaty Organization Standardization Agreement

STANAG NO. 3379
In-Flight Distress Signals

Participants agree to adopt the following distress and informational signals between aircraft in the event of radio failure in flight. Attention will first be attracted by rocking the wings of the aircraft laterally or by flashing the navigation lights.

In conjunction with the undermentioned signals, a *thumbs up* or a *thumbs down* signal will indicate satisfaction or dissatisfaction as appropriate.

Emergency Signals (Day)

Bailing Out. One or both clenched fists pulled downwards across the face to simulate pulling the ejection blind.

Desire to Land. Movement of the hand, flat, palm downwards, from above the head forwards and downwards, finishing the movement in a simulated round-out. Alternatively, lower the undercarriage.

Systems Failures (HEFOE) (To be used only when radio contact is not possible). Pilot will clench the fist and hold it to the top of the canopy; after passing this signal he will hold up the required number of fingers to denote the system involved (see below). The pilot receiving the signal will repeat the signal to show acknowledgement:

*H*ydraulic—one finger;
*E*lectrical—two fingers;
*F*uel—three fingers;
*O*xygen—four fingers;
*E*ngine—five fingers.

Note: If either the one finger signal is received or the intercepting pilot is unable to understand the signals of the pilot requiring assistance, then the intercepting pilot is to assume that the aircraft in distress has one or more systems inoperative (e.g. speed brakes, flaps or undercarriage) and is to proceed with extreme caution.

Radio Failure. Tap microphone or earphone and give the thumb-up or thumb-down signal as appropriate.

Emergency Signals (Night)

Because night signals will be difficult to understand, only one night signal will be used:

Repeated Intermittent Flashes With a Torch

This signal indicates that the aircraft is in distress and wishes to land as soon as possible. The lead aircraft should assume that the aircraft in distress has one or more inoperative system (for example, speed brakes, flaps or undercarriage) and should proceed with extreme caution.

Be careful not to dazzle the other pilot with the torch.

Information Signals

Fuel Status. Make drinking motion with closed hand, thumb extended toward mouth. Report an estimated flying time remaining by extending fingers, each finger to indicate 10 minutes, a closed hand indicating one hour. (Example—Clenched fist and three fingers will mean one hour and a half.)

Request Tower Permission to Land. Fly across the airfield in the direction of the intended landing, rocking the wings laterally. Height to be below 1000 feet or 300 meters.

Reply from tower will be as follows:

Type of Signal	*Meaning of Signal*
Steady green	Cleared to land
Steady red	Give way to other aircraft and continue circling
Red Pyrotechnical light	Notwithstanding any previous instructions do not land for the time being
Series of green flashes	Return for landing*
Series of red flashes	Aerodrome unsafe, do not land

* Authorization to land will thereafter be given as a steady green light

Efficiency

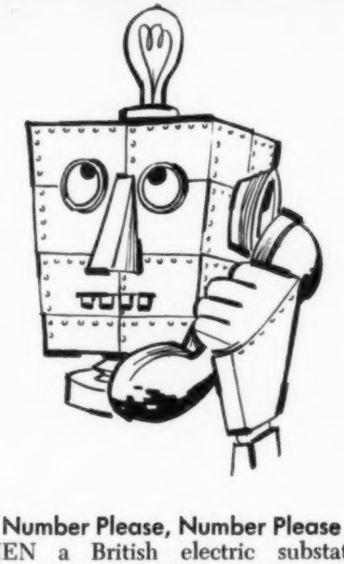
RISKS are a necessary part of a worthwhile progressive life. The risk should not be greater than the value of the undertaking. Proper supervision increases the value and decreases the risk.

Accident prevention is a worthwhile goal that is intimately connected with efficient management, intellectual supervision, and complete manpower and equipment utilization.

We need not treat safety as a separate part of our planning or our accomplishments, neither should we separate the principles of safe driving from safe flying, safe recreation from safe working, or safe living from ethical thinking. In the final analysis, accident-free days are the pleasant by-product of efficiency. *Courtesy of USAF*

Expensive Motivation

"Too often accident prevention stems from an accident and the lengthy investigation which follows. We cannot afford, either morally or economically, the toll of lives and aircraft resulting from this anachronism. The volume of AARs received at this headquarters suggests that *more time is spent investigating accidents than preventing them.* Although personnel error frequently enters the picture requiring insight into the human factors involved, we must also concentrate on design and engineering safety and report unsatisfactory or accident inducing man-machine systems." *—AirPac Bulletin*



Number Please, Number Please . . .

WHEN a British electric substation broke down, a robot dialed the telephone operator and released the recorded message: "There is a fault at this power station. Please send repairman."

Nobody had informed the robot that the operator's dial number had been changed from "O" to "100", however, so all day long a second robot at the other end kept instructing the first robot: "You no longer dial "O" for operator. Please replace your receiver and dial '100'." *—Business Automation*

All Pilots Read

Trained to Excel

"It is of the utmost importance for everyone directly concerned with the maintenance and operation of aircraft to be indoctrinated with the thought that ordinary standards of care are inadequate where aircraft operation is concerned.

"Superlative aircraft performance requires superlative skills and superlative standards from personnel both on the ground and in the air. This underlies the importance of the various training programs. If one could compress into three words the requirements for personnel, it would be to say that they are 'Trained to Excel'."

FSF, Inc.
Accident Prevention Bulletin 63-4

Exposure, Experience . . . Education

The Kellogg foundation, in a booklet describing its role in continuing education, quoted Crawford Greenewalt, chairman of E. I. du Pont de Nemours and Co.: "An education is not a single entity, developed in a few semesters of study and delivered with the diploma. It is a never-ending process built up over years of exposure and experience. Many of the interests which broaden and enrich our lives and our careers are developed long after we have left school."

"The greatest single obstacle to the prevention of aircraft accidents is complacency."

Commander, Naval Aviation Safety Center, in Aviation Safety Officers Guide

Time Heals Some Wounds

Air station command and public information officers, beset with an occasional sonic boom complaint or low flying report, may enjoy the following quote from a recent USAF Air University Review:

In 1908 five years after the Wright brothers made their first flight, the progressive and safety-minded citizens of Jacksonville, Florida took the first recorded action to make flying safer over their city. They passed an ordinance which read approximately as follows:

- No machine will fly over any part of the city of Jacksonville at a height of 10 feet at a speed in excess of 8 mph, or at a height of 20 feet in excess of 15 mph, or at a height of 50 feet in excess of 30 mph, or at any altitude whatsoever at a speed in excess of 50 mph.
- Air machines will be equipped with warning horns, braking devices, safety devices, and a parachute to let the machine down if the engine stops.
- No air machine will collide with buildings or structures public or private.
- Funds are authorized to the city constable to purchase an air machine that he may pursue and arrest violators of this ordinance.

Good Headwork

In recent weeks, there have been several cases of pilots taking off and noticing their transmission oil pressure go zapping down. In almost all instances, the temperature gage did not show any great rise. The pilots' assumed that the pressure gage was just broken, but *landed anyway to have it checked* in accordance with the procedures on the red pages. In all cases some malfunction of the transmission oil pressure system was discovered, including some cases of pump shaft failure. This kind of action on the pilots' part is what we're after! – *MAG-26 Safety Bulletin*

Top-Ten Attributes of Leadership

WHAT are the top-ten attributes of leadership as listed by subordinates? An answer to that question has been developed by employees participating in the Potential Supervisor Training Program conducted after working hours at the Norfolk Naval Air Station. Using the discussion method, the groups selected the following desirable attributes for good leadership:

1. Intelligence
2. Fairness and impartiality, with firmness
3. Understanding and pleasantness
4. Dependability (sets good example)
5. Loyality up and down the line
6. Concern for subordinates
7. Sense of humor
8. Sincerity
9. Praises in public – criticizes in private
10. Enthusiasm – promotes and inspires teamwork and cooperation.

NIGHT CALL

The catapult officer gave the signal for the night launch of the EA-1F and the shot was started. Initially, acceleration was normal but immediately ceased. As the plane moved forward there were sparks about the area of the left main gear. Veering to port and rolling over the catapult, the plane continued over the side, nose down into the water, turning over on its back.

"I felt a series of sharp impacts," says the pilot, "and found myself staring over the nose of the airplane straight at the water.

"In the next instant after another fairly heavy impact I was under water. Realizing I was upside down, I released my seat belt and pushed strongly with my legs. I slid out of the cockpit without any hinderance from shoulder harness, mike and earphone, or canopy bow. Came up under the port wing and moved aft to clear it, then popped up at the intersection of the port flap and fuselage.

"The carrier was still going by and the waves were considerable. I grasped the foot step underneath the port side of the aircraft fuselage and tried to clear the sea water from my throat and nose so I could breathe. About this time my crewman popped up beside me and grasped the airplane and me. It became obvious that the airplane was sinking rapidly so I let go of the step and started to release the parachute fasteners so I could inflate my life vest. The crewman was still holding on to me, hampering me somewhat, but then he let go. I inflated my life vest. I still had my left arm through a loop of the parachute pack. It was beginning to drag me down so I let go of it.

"The crewman was floating near me. His vest light was on—this reminded me to turn mine on too. After a moment we had drifted further apart. I could no longer see him but he began firing tracers. I emptied my pistol, cocking it with my left hand and firing it with my right. At this time lights were approaching. I reloaded and fired two more cartridges. Then the pistol jammed and I could not open the cylinder to load. I let go of the pistol and let it sink.

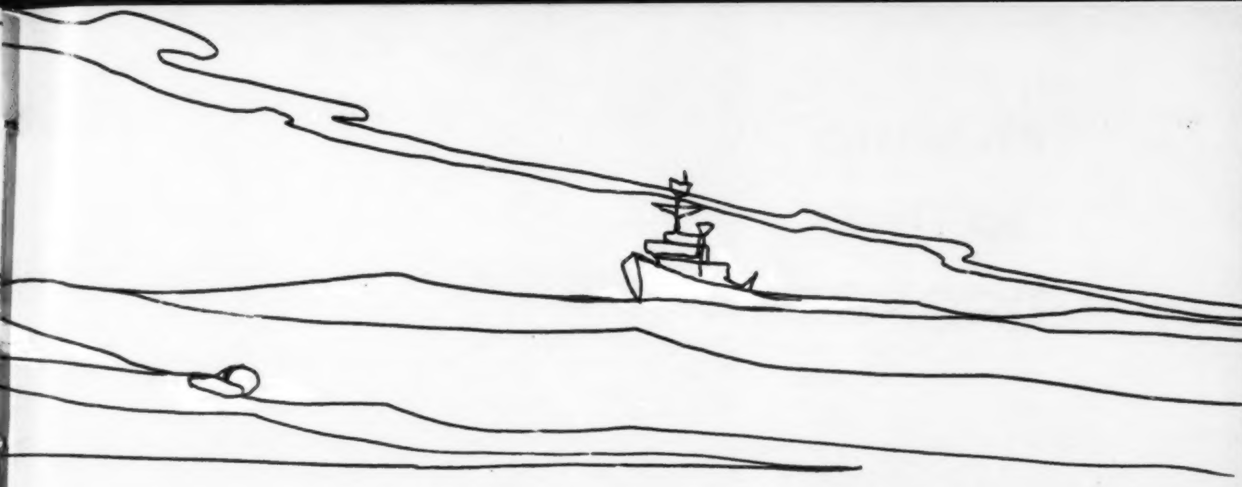
"The crewman was yelling to the approaching destroyer for help. I also yelled and began to swim toward the ship. Once during this period the crewman and I were on top of waves at the same time and I could see that he was floating upright with his head held up.

"The only time I was able to take several consecutive breaths without having a wave wash over me was while I was swimming toward the destroyer. I had previously considered removing my helmet as it kept me from throwing my head back but decided against it for fear that I might be struck on the head during the rescue.

"The destroyer's bow came alongside me. I grabbed a rope trailing from the forecastle. Shortly thereafter, an ensign from the destroyer jumped in beside me and helped me hang on.

"Further aft at a cargo net several men were struggling in the water but the waves were again washing over my head and I was too busy to watch what was going on. An attempt was made to lift me in a stretcher with ropes tied to both ends but the rig was not workable. I continued holding on to a rope with the help of the ensign.

"After what seemed to be about 10 minutes, a horse collar was lowered and was slipped on me. I started up with my hands in the approved position



on the line. This didn't feel secure so I clasped my hands below the collar until they laid me down on the deck of the destroyer.

"My conclusions on the survival part of this accident are:

- If my strength had been seriously impaired by cold water, long immersion or serious injury, the survival situation would have been a most difficult proposition.
- The horse collar is a useful device when the rescuee is conscious and has at least one good arm; otherwise it is well-nigh useless.
- My Dilbert Dunker training was a great help in preventing panic when I found myself upside down under water."

Resuscitation work on the crewman was unsuccessful. Medical personnel concluded he drowned in the short period of time between ditching and positive sighting by the destroyer. He was apparently uninjured except for a bruise under the chin, probably from the helmet chin strap.

The investigating flight surgeon makes the following recommendations concerning water survival at night under conditions similar to those of the above accident. He believes the general principles apply to all water survival situations:

1. Hook the lanyard from the PK-2 pararaft to the D-ring extension of the Mk-2 life vest prior to flight when this equipment is being used.

2. Wear oxygen mask at 100% oxygen on all launches from carriers (not routinely done in the EA-1Fs). This may add valuable time to planning exit and survival steps under water.

3. Immediately after ditching aircraft, concentrate on obtaining maximum buoyancy.

- Unfasten parachute harness immediately and remove pararaft from seat pack.
- Completely inflate life vest as soon as possible including oral inflation.
- Inflate the life raft and get in it.
- Keep parachute and attach to life raft for possible survival use, but not at the risk of drowning.

4. Only after maximum buoyancy is obtained should efforts be directed toward signaling rescuers.

- Keep helmet on for protection and also because the reflective tape is easily spotted by searchlights at night.
- At a distance, tracer bullets are an aid at night but precise localization is difficult because they are not seen until well above the level of the water.
- Flashlights are useful to aid localization and should be carried.
- When help is close, the night distress signal is more useful than tracers for precise localization.
- A whistle should be carried. It is an effective means of audible signaling when in range—more effective and less energy-consuming than yelling.

5. The rescue phase is expedited if the plane guard destroyer crew knows what type of aircraft is down. Then rescuers know what kind of survival equipment will be encountered on the survivors. Rescuers should also be familiar with the various types of survival equipment used by aviators.

6. Dilbert Dunker training proved valuable in this survival episode. The importance of water survival training cannot be too strongly emphasized. This, of course, means familiarity with equipment to be used.

'Thanks to the Chopper'

CHAINS had been removed from an F-8D prior to the ship's first launch of the day but chocks were still in place. Removal of a tow bar had left the nose wheel cocked. The ship was just completing a port turn when jet blast from an RF-8A moving forward struck the F-8D's nose. The F-8D pivoted around the stationary starboard main gear, and, escaping the port chock, rolled over the side. It struck the water inverted with the nose pointing up at a 30-degree angle in the opposite direction from its previous position on the deck.

Observers saw the pilot moving his arms about the top of the canopy which was submerged with each wave. After several moments, the canopy came open. The pilot tried to extricate himself but before he was clear, the aircraft sank. Here is his account of his escape and rescue. . . .

"I was inverted when I hit the water. Immediately tried to blow the canopy with the canopy jettison handle. It didn't work. Was reaching for my survival knife to punch my way out when decided to try to open the canopy manually. It worked. I appeared to be on my side and still floating. The cockpit immediately filled with water and I started sinking. I pulled the canopy harness release handle to separate the seat and the canopy slammed shut. By this time I was underwater. Holding the canopy open with both hands, somehow I got out.

"I have no idea how far down I was. It seemed to take an awfully long time to reach the surface. My bailout bottle must have tripped because I breathed oxygen all the way. My mask didn't leak. Inflated my mae west and rose to the top.

"Hadn't detached anything when I left the aircraft so all the gear came with me. When I reached the surface my good friend the angel was right there waiting for me." (The helo pilot reported that the pilot bobbed up "facing the ship and swimming.")

"I straddled the seat and was pulled part way up," the survivor continues. "Had some difficulty getting into the chopper—they couldn't pull me up. They tried to get me to release the rocket jet fittings while hanging in midair but I couldn't make the fittings release—had them lower me back into the water where got some slack and released the chute. With the chute gone they pulled me up. I had no trouble getting into the helo. The crewman and I released the seat pack when I was aboard. An outstanding job and my thanks to the chopper pilot and crewman. . . ."

The whole rescue operation required a little less than five minutes.

NOTES FROM YOUR FLIGHT SURGEON

Jet Blast

A PLANE captain was on his way to the port catwalk directly aft of an A-3 when idle power jet blast from the starboard engine blew him overboard. The helo rescue attempt was unsuccessful and he was lost at sea.

Recommendations from the investigating board were:

- That all personnel working on the flight deck be continually reminded of, and re-educated on the dangers of jet blast. Supervisors must emphasize that the A-3 has two engines and develops a very large blast area.
- That all levels of command must indoctrinate personnel under their supervision that "haste makes waste." The end results of short cuts are generally obvious.
- That rescue helicopter pilots have their crewmen enter the water as soon as they hover over victims in man overboard situations. The victim generally does not have flotation or survival gear. Personnel working on flight decks of carriers often are wearing heavy clothing which is very absorbent. This extra weight as well as the possibility of injury and shock warrants the assistance. By the helicopter crewman automatically entering the water, precious time might be saved. Time can mean the difference between success and failure.
- That flotation equipment be provided for flight deck personnel. The need for flotation equipment issue to flight personnel has been in existence since carrier aviation began. This gear must be small and compact so as not to restrict the movement of personnel working around aircraft (e.g., plane captain climbing in aircraft, maintenance personnel working under engine cowlings, etc.). Cognizant research personnel should make a maximum effort to develop this much-needed equipment for immediate distribution to the fleet.

Here are the latest developments, at this writing, of work on flotation gear for flight deck personnel:

Requirements for flight personnel life preservers were determined in a conference in April. Representatives of ComNavAirLant, the Naval Aviation Safety Center, BuShips and the Applied Science Laboratory attended. The preserver, it was agreed, must be comfortable and durable, inherently buoyant or be equipped with an automatic inflator, and contain a visual and oral signalling device. No known preserver for flight deck personnal now available meets these requirements.

The Applied Science Lab will test and evaluate a new type preserver with the required characteristics and will make recommendations by mid-summer. *Every effort will be made to expedite the recommended product.* BuShips strongly recommends, as an interim measure, use of shipboard packaged inflatable life preserver now on board for personnel on all aircraft elevators and areas of flight deck where practicable. (See Feb. 1964 APPROACH, p. 31.) Message 042127Z May refers.

Danger to Children

ALL hands should be aware of the hazards of using the PSK-2 Survival Kit in the home or in personal camping kits. The PSK-2 Kit contains drugs which can be harmful to any consumer, especially children. One of these drugs can cause death in a small child since *there is no known antidote effective for small children.* All hands are reminded that these kits are *not* intended for civilian use and should *never* be taken home.

Egress from F-8 Aircraft

DURING an aborted takeoff an aircraft ran off the end of the runway and caught fire. The pilot experienced some difficulty during egress due to the composite seat-pan-to-console connection. He abandoned the seat pan by releasing the thigh rocket jet fasteners. His trouble was due to not pulling directly up on composite quick disconnect in the console.

Emergency Ditching Drills

GOOD intentions are sometimes forgotten and so it goes with emergency ditching drills; they must be run regularly and completely. An APPROACH feature told the story of a P-5 crew that had to ditch. Fortunately for this crew, the submarine they were tracking picked them up.

Human factors (complacency and lack of training) are present in any squadron. It is not enough that everyone in the crew get out of the aircraft safely and through a certain exit *and carry certain things* out with them. Getting out is one thing, surviving a successful ditching is another.

It is again strongly recommended that through dry-run ditching drills we make sure that personnel know where survival gear is stowed and that they know how to use it. Make them inflate a raft, and possibly float around in it. Make them ignite flares so that they can do it in the dark with slippery gloves on and know which end to light.

—Fleet Air Wing Six Medical Aviation Safety Meeting

True or False?

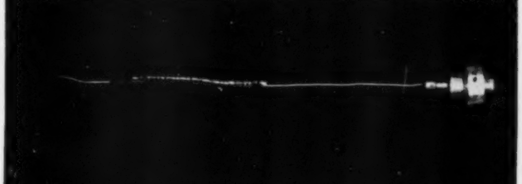
Each false alarm by a fire detector in flight costs an airline about $2500 according to FAA estimates. A comparison of Navy losses through man-hours expended for unscheduled maintenance, loss of mission-readiness and aborted takeoffs might prove interesting if such figures could be guestimated.

One thing certain, an inflight fire is one of the worst possible hazards a pilot can face. Because of this, aircraft are fitted with fire detection systems and some with a fire extinguishing system the pilot can use in flight—some are equipped with ejection seats. Sensors are installed in the most critical fire hazard areas, wires are run to the cockpit and hooked to warning lights. Fire extinguishers with manifolds to critical areas and controls are installed. A real simple system—except two things are happening—1. fire warnings with no fires, 2. fires with no warnings. NASC records of 225 reported inflight fire warnings during a 5-year period ending in May this year indicate 76, slightly over one-third of these pucker string pulling situations were false—the result of poor design coupled with improper maintenance.

Of course we're not the only ones having false fire warning troubles. The Air Force reports the situation got so bad in the B-47s that the engine fire warning system was disconnected. They got wise to the fact they were having more panic and unnecessary engine shutdowns trying to cope with false fire warnings than they were from inflight fires. Also while flying the Pacific some years back, flickering red fire warning bulbs when flying in heavy rain at night (no fire, of course) made it difficult to fly instruments through heavy turbulence.

The commercial carriers have been plagued with the same problem for years. Here's a report:

"No. 3 engine was shut down when fire warning indication was experienced during stage three. No visual signs of overheat were evident. Aircraft landed without incident (he had three other engines). Ground inspection revealed left burner section sensing element malfunctioning. Changed element and system operation was then normal."



GOOF PROOF—Or, how not to make a fix. An attempt to splice a fire warning element lead in this fashion was a complete failure — it could not work. Cracked or broken fire warning elements cannot be repaired or sealed. Replacement is the only fix.

Why?

The record of false warnings seems to indicate that too many mechanics are not really aware of how fire detection systems work.

A fire detection system consists of a detection element, some relays, a control box, lights and possibly bells. The element is somewhat like a spaghetti-like tube, containing a low voltage conductor. This conductor is insulated from the tube shell by a salt solution or thermister material which loses resistance as heat is increased. When sufficient heat is applied, current will flow from the conductor to the grounded wall of the element (sometimes a ground wire runs within the element tube parallel to the conductor). This current flow energizes the alarm system.

This same alarm sequence can occur through artificial means. For example:

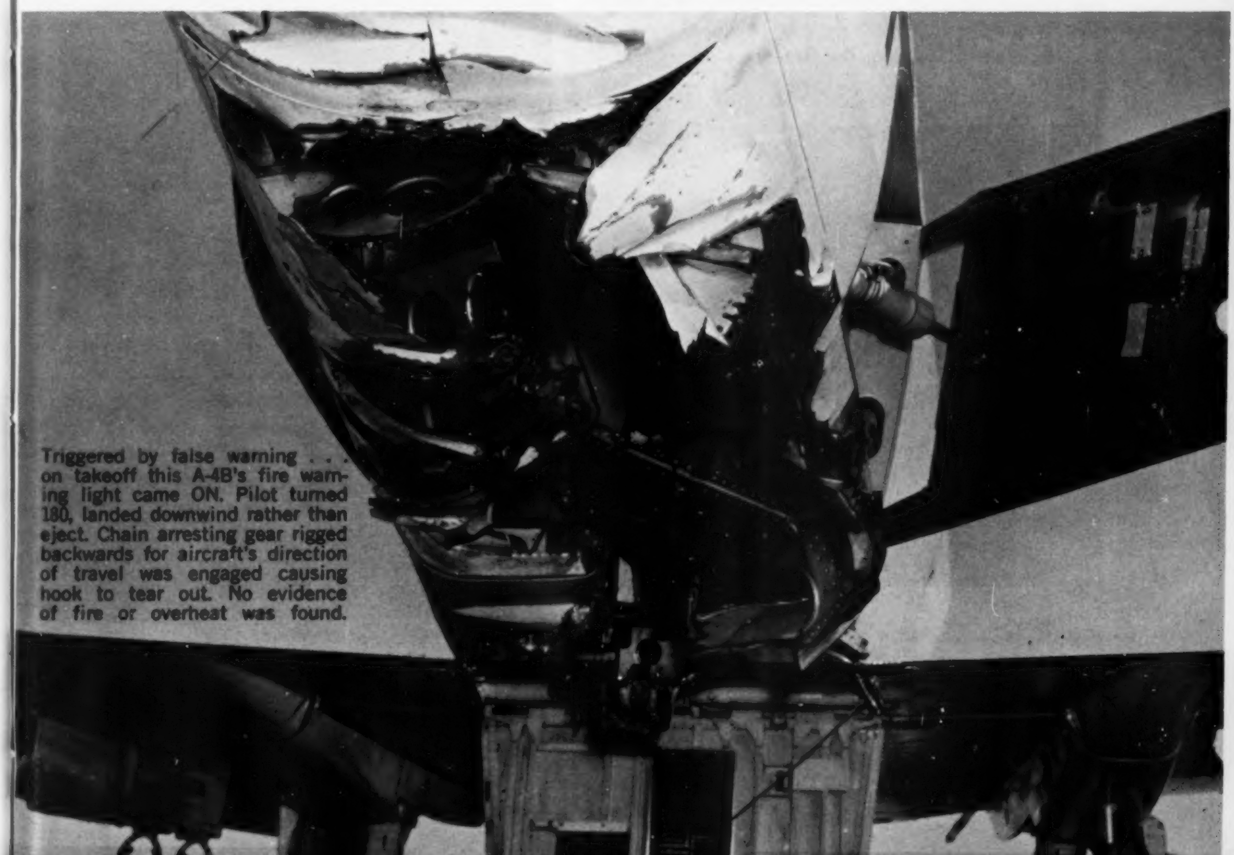
- An element or lead chafes and shorts on ground structure.
- An element chafes and allows penetration of conductive moisture.
- An element is bent sharply, thus decreasing the insulation distance.
- An element is displaced too close to engine case or deicer line.
- A connector looseness allows moisture penetration.

When any work is performed near fire detectors, extreme care must be taken to prevent damage to the element. Please do not just bend an element out of the way; it is very simple to unclamp and move it without causing distortion.

An inspection by mechanics and quality controllers should be a part of the final check-out of work done adjacent to fire detectors. Look for the following:

- Chafing elements or leads
- Sharply bent elements (especially at connectors)
- Element too close to engine case or deicer line
- Loose connections.

Careful attention to foregoing details will help reduce the number of false warnings and insure warnings when real fires exist. If we keep going the route we're now going all we really know is that the bulb works.



Triggered by false warning . . . on takeoff this A-4B's fire warning light came ON. Pilot turned 180, landed downwind rather than eject. Chain arresting gear rigged backwards for aircraft's direction of travel was engaged causing hook to tear out. No evidence of fire or overheat was found.

Another Case in Point

At 400 feet on GCA final a P-3A's no. 1 engine fire warning light and horn came ON. The light went out and the horn stopped as the engine was secured using the emergency handle. After an otherwise uneventful landing the engine was restarted following a thorough inspection which revealed no evidence of fire or abnormal temperature. Ten minutes later the fire warning light and warning horn again came ON. The engine was again secured with the emergency handle. But the light and horn remained ON. Both fire bottles on port side were discharged into no. 1 engine with no effect on the fire warning indications. Light and horn operation quit when electrical power was secured but actuated with each subsequent application of ground electrical power as late as two hours after shutdown.

Troubleshooters found a bent pin in the fire detector receptable above the tailpipe and the ceramic insulation on the male plug of the sensing element chipped at the point where it comes into contact with the receptacle pin. This condition provided a ground for the element causing the fire detection system to actuate.

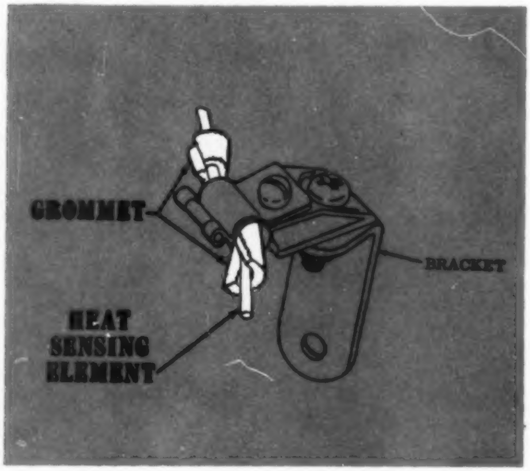


Illustration shows how a grommet looks after deterioration or softening from heat or oil. Several element failures have occurred after grommets have completely disappeared or have softened to a point where they give little support and protection from the clamp. When a grommet is approaching this condition it should be replaced. One airline has found teflon-impregnated grommets, gray in color, more rugged than silicone rubber grommets.

SEVERAL major improvements in the fire detector system are in the offing. This preview should help answer questions about the routing and mounting of the sensing elements on engine access doors 83 and 92.

Door 83 L/R

Despite ASC 109, which incorporated heavier springs on the flexible conductors looped across the door hinge areas, the conductors are still being pinched during close-up. Also, on door 82, left and right, the boundary layer control and impingement starting ducting is rubbing against the sensing elements. Similar damage is resulting from the engine fuel drain line sagging on the sensing element directly below it.

Door 92 L/R

Aside from the flexible conductors being caught in the door hinge area, the only other problem on this door is the routing of the element near the fuel tank drain fitting causing some chafing damage to the elements.

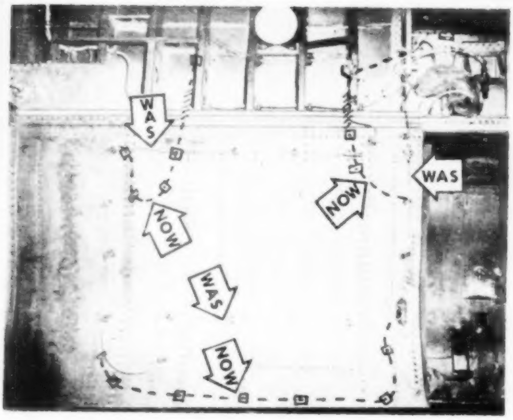
AFC 161 will be issued later this year to alleviate these problems in BuNos 142260 through 151497. This AFC will re-route the sensing elements on doors 83 and 92 left and right to prevent chafing, increase the bend radius at several critical points, and modify the connector mountings. These changes will be incorporated in production on BuNo 151498 and up. In addition, complete instructions with appropriate warnings regarding proper maintenance and handling will be included on the next revision to the manuals along with full illustrations.

The photos included here give a general idea of how the routing will be modified. Moving the flexible conductors near the door hinges will also result in some slight rerouting of the sensing elements on the keel structure.

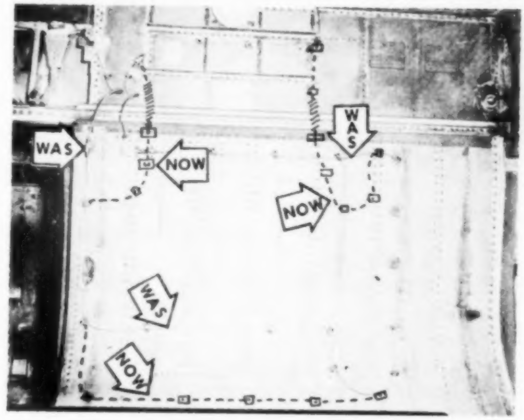
The recess shown on door 83, left and right, has been incorporated in production at Block 10, BuNo 149427 and subsequent, to eliminate the chafing problem caused by the engine fuel drain line.

Although the situation will be improved considerably when AFC 161 is incorporated, it is not the cure-all. Careful handling and proper maintenance are still the major part of the remedy.—*McDonnell Field Support Digest*

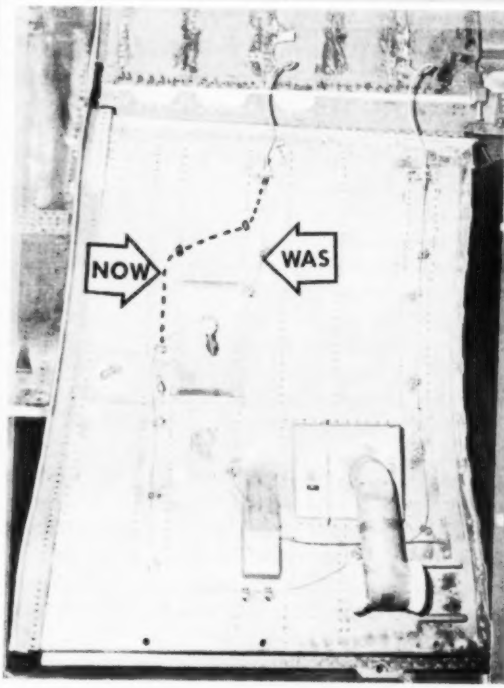
F4B Fire Detector Improvements



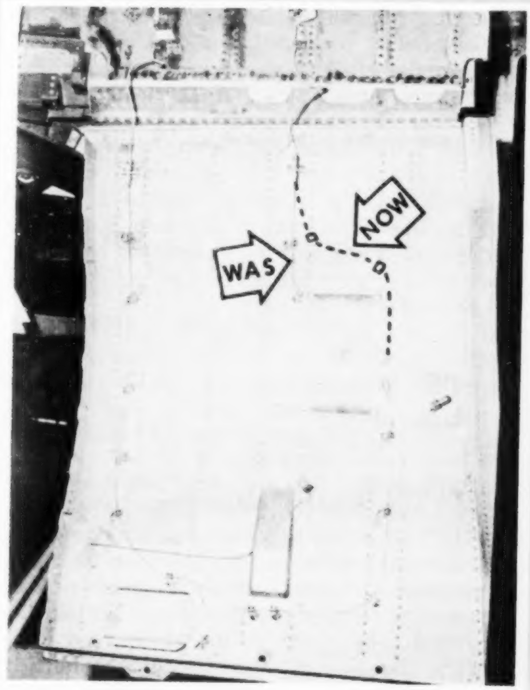
ENGINE ACCESS DOOR 83L



ENGINE ACCESS DOOR 83R



ENGINE ACCESS DOOR 92L



ENGINE ACCESS DOOR 92R

Repeated Squawks

IF YOU experienced a flat tire on your car, what would you do about it? Although you can't deny that there are those who would, not many of you would pump the tire up just to see if it would go flat again. Most of you would put on the spare, then have the flat inspected and repaired.

An airplane shock strut that goes flat isn't much different from a tire, except that oil as well as air is added to the strut. In the case of the tire, when it gradually goes flat there is a cause, normally described as a leak.

Couldn't you deduce that if an airplane shock strut were continually going flat, there also must be a *reason*? And isn't it your job to find the reason and effect the repair?

All too often some fall short in responsibilities in this regard. For example, during a single two-week period, one aircraft had its right main landing gear strut go flat 13 times.

The flight crews reported the flat strut in the log each time it happened, and on all except the last one, the stock "fix" report written by the maintenance crew was either "serviced with air and oil" or just plain "serviced." The *fourteenth* and final action noted was, *"replaced strut seals."*

Here's another case. One airplane experienced 10 delays and one change of equipment in two days because of a leaking left main gear strut. One air valve and seal were replaced, but to no avail. Finally, the strut seals were replaced and this corrected the difficulty.

If the strut fluid is leaking at the O-ring seal area, no amount of air valves or valve seals will correct this situation. Early strut seal replacement is the only action that will nip this type of squawk in the bud.—*Flight Safety Foundation*

Washer Warning

WHEN discolored paint was discovered on both sides aft of the engine pylon on an A-3B, investigation revealed aluminum washers had been used in place of steel washers. A hot air leak developed when heat destroyed 18 aluminum washers and caused loosening of the tailpipe assembly from the basic J-57 model engine.

Users should insure that steel washers AN9600-416 are installed when joining the tailpipe to the engine.

F-4 Braking

THREE F-4 ground accidents have occurred during handling operations while operating at sea. Each of these accidents was primarily related to the inadequate braking system available when moving the F-4 without engine power. The most recent accident resulted in substantial damage to the aircraft and could have caused death or serious injury to maintenance personnel.

In this case the aircraft broke loose from the tow tractor when the tow bar failed and the brake rider was unable to stop the aircraft by means of either the normal or emergency pneumatic brake systems. Only after exposing hangar bay personnel to extreme danger was the aircraft finally secured.

Indications are that the emergency pneumatic brake system is usually used during towing operations. Although it is clearly stated in the Flight Manual that this is not the designed purpose of the emergency pneumatic brake system, it has become necessary to use it. Manual operation of the normal brake system is ineffective and cannot be relied upon to stop the airplane during even moderate deck roll conditions. The emergency pneumatic brake system is effective, but only as long as sufficient air pressure remains in the storage bottle. The brake rider has no means of knowing how many brake applications remain before the air supply is depleted. In one case a crewman was injured when his foot was run over by the nose landing gear wheel as he tried to read the remaining air pressure from the gage in the wheel well. Although this could have been avoided by stopping the aircraft before entering the wheel well, the fact remains that design deficiencies in the brake system encourage taking unnecessary risks.

Squadron personnel feel that manual operation of the present brake system would be satisfactory if the brake pedal throw were modified so that more foot pressure could be applied. As now designed, it is virtually impossible to exert enough pressure on the brake pedals to provide adequate braking action.

It was recommended that BuWeps evaluate this problem and consider a design change that will ensure effective manual braking with engines secured, independent of the emergency pneumatic system.

The Ten FOD Commandments

I Thou shalt account for all thy tools and parts used or replaced on the completion of thy job.

II Thou shalt not use intake ducts for the resting place of thy tools for verily the T-56 is a ravenous digester without discrimination.

III Honor the confidence and responsibility placed upon thee as thou undertaketh thy duties to the end of thy days.

IV Thou shall not be so proud as to not bow down in the presence of debris upon thy ramp and taxiways and remove same for such is the way of cleanliness.

V Thou will use only the minimum power necessary for turn-up for great is the suction of thy engine.

VI Thou shall always be neat in thy appearance and not wear loose clothing or carry tools in thy pockets which may fall into dark and inaccessible places without thy knowing, for such items may return unwanted to haunt thee to thy grave.

VII Thou shall never turn up thy engine until it is insured that all cowls are fastened, inspection doors secured and loose parts removed, for great is the wrath of the Maintenance Officer upon damage to his beloved.

VIII Thou shall acquaint thyself with the various sizes and types of foreign objects which may incur damages to thy engine.

IX Thou shall assist thy subordinate in accomplishing his job and inspect to see if it is correctly completed.

X Thou shall heed these commandments to the utmost for then surely thou mayest walk through the valley of the hot and dusty and fear not, for thy FOD procedures will protect thee. For it is said that the sound of weeping by the CO and the gnashing of teeth of thy civilian brethren as they reach for the pocketbook will render thy heart asunder.

—C. H. MONROE
OPS OFFICER VP-30 DET. A

Inherently, aviation ordnance is a deadly serious business and improperly loaded or armed explosives make it even more so. Here an oldtimer brings the need for proper training and utilization of ordnancemen into focus—

Boom or Bust

By GENE SPELMAN, AOCM
Ordnance Analyst, NASC

During the last two years many incidents have been reported to the Naval Aviation Safety Center which tend to point out that many ordnancemen working on naval aircraft today lack knowledge about their equipment and the explosives they are responsible for.

The many incidents of inadvertent release of stores on takeoff and on the way to targets, stores ejected when safety pins were pulled, and ejection of stores and auxiliary equipment during wire checks are indicative of a lack of know-how or complacency on the part of the individual ordnanceman and his supervisor.

Let's review a few incidents:

1. An inexperienced ordnance striker plugged an Aero A6 pig tail into an Aircraft Rocket Circuit Tester in the rocket plug-in area and fired two rounds into a hillside.

2. In nine instances, ordnancemen crossed the leads of the Aero 20A ejector rack on the A-4 aircraft, each time resulting in the jettisoning of practice bomb racks on the first bombing run. Though this is a design Murphy, every man working on this equipment should be alerted to the problem.

3. An ordnanceman in a P-2 squadron loaded two depth charges with .01-second delay nose fuzes and hydrostatic fuzes. The bombs were dropped with both fuzes armed from 200 feet and the second drop resulted in the aircraft being damaged by bomb fragments. Though this case was categorized primarily pilot error, it indicates a total lack of knowledge on the part of the ordnanceman of the explosive capabilities and the correct drop altitudes for weapons carried in his aircraft.

4. An A-1 pilot, unable to drop his bombs on the target, diverted to a shore station. Three bombs separated from the aircraft at 500-foot intervals after touch-down. A DIR on the racks stated, "they were corroded beyond safe use."

5. In two squadrons, ordnancemen displayed a total lack of knowledge of how to properly arm a torpedo. In one squadron, all torpedo arming had been done by torpedomen. In the other activity, numerous drills were held but even then the ordnancemen only simulated arming the fish.

All these incidents can be attributed directly to the ordnanceman. Staff personnel inspecting squadrons say that the main complaint heard from supervisors is the low experience level of their personnel. They also state that in many activities the senior ordnance personnel are assigned to non-ordance billets such as Shore Patrol, career counseling and education or that the ordnance chief is frequently the Leading Chief of the squadron. In many squadrons, the ordnance shop is undermanned because practically all the trained strikers are assigned as mess cooks, compartment cleaners and the other sundry billets that must be filled. Some squadrons are evidently overstaffed with ordnancemen, yet, the A-1 squadron in the incident which was cited stated, "present ordnance manning level in A-1 squadrons is a limiting factor in ordnance capability." With the experience level continually dropping, assigning the experienced personnel to duties away from the ordnance shop is asking for an explosive incident.

The use of inert stores not configured the same as service ammunition for practice loading drills is, for all practical purposes, useless. To load stores and simulate arming hookups can only result in confusing the troops. When these same people are required to load service rounds, the end result will be a large percentage of duds. Squadrons loading inert or dummy stores during loading drills should demand that the inert item be configured externally the same

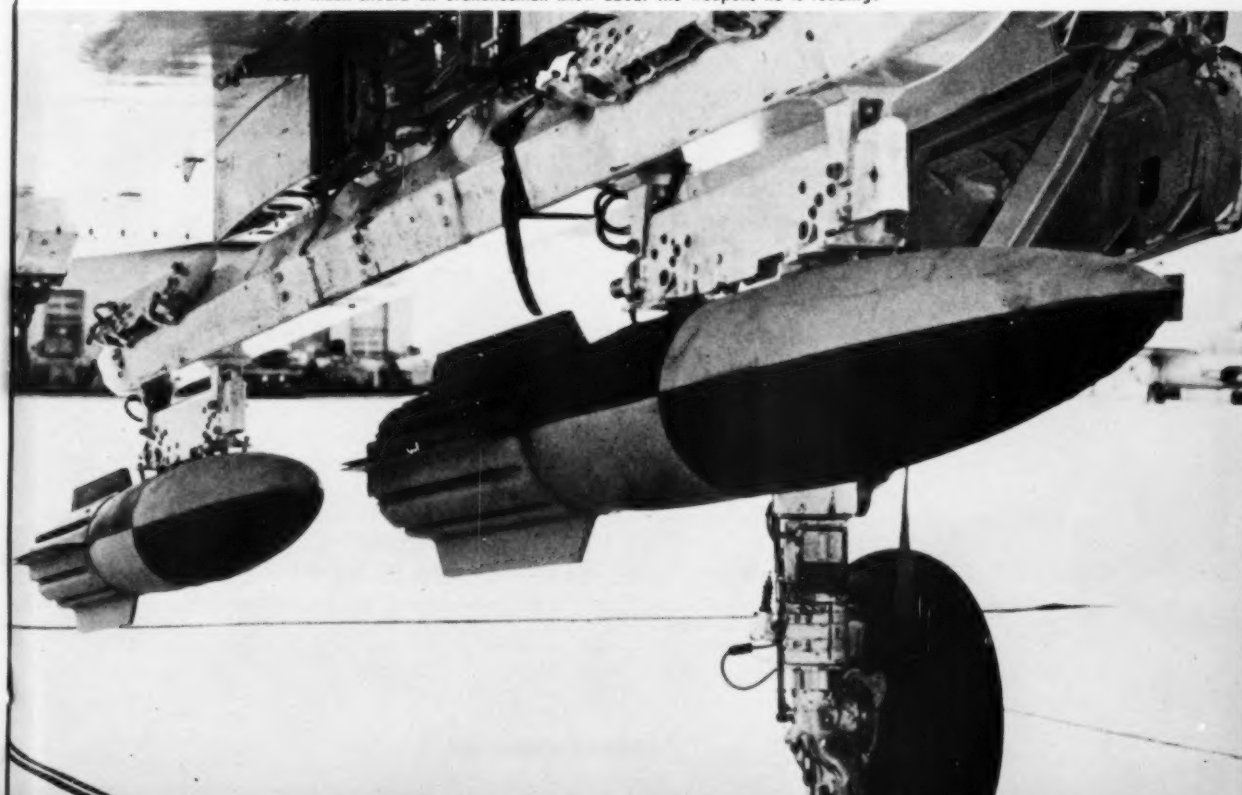
as a service round. Every ordnanceman in a squadron should be able to load and arm every store listed in Sec. V of the flight manual or Sec. 1 Part IV of the NATOPS Flight Manual.

The use of checklists during the various wire checks and loading evolutions is a must. Compliance with checklists will prevent incidents such as ejecting bombs when the safety pins are pulled, the jettison of external tanks while wire-checking missile circuits. Inexperienced personnel must be made to comply with the step-by-step procedures or checklists. Personnel making up these checklists must insure that they are correct and will preclude an incident/accident if they are followed. An incorrect or incomplete checklist is worse than none at all.

How much should an ordnanceman know about the weapons he is loading? Should not an ordnanceman know as much about his weapons as the mech knows about his engines, the technician about his search and comm gear? The ordnanceman should be able to answer any question about the stores loaded on his squadron aircraft. He should know what the settings are on the fuzes he is installing (electrical fuzes excepted) and the correct drop altitudes and airspeed. We wonder today how many pilots in a patrol squadron could call the ordanceman on the ICS and receive a correct answer concerning the drop speed for a torpedo? How many carrier pilots could get a correct answer if they asked the ordnanceman loading their aircraft the minimum drop altitude for the bomb being loaded? In the P-2 incident cited, this information might have prevented a damaged bird.

Many of the ordnance problems of today could be eliminated if the ordnanceman would read and study the various aircraft manuals, ordnance pamphlets and other aircraft publication concerning his aircraft and the stores they are designed to carry. Training lectures should include information on the use of technical publications and other sources of pertinent data. Squadrons should have publications available for study when the work is slack. Lectures should include information on the delivery techniques employed by the squadron aircraft. Perhaps this will increase the interest of the conscientious ordnanceman, encourage him to improve his knowledge and prevent aircraft and explosive incidents/accidents.

How much should an ordnanceman know about the weapons he is loading?



MURPHY'S * LAW

Recently two pilots picked up a TS-2A which had completed PAR for return to home base. On preflighting the aircraft, which was rigged with a torpedo bay auxiliary fuel tank, a fuel leak was noticed in the area of the after end of the bay.

O&R Line Maintenance personnel "fixed" the leak by installing another fuel transfer pump and replacing the lines. With no further leakage and another thorough preflight the pilots launched for a VFR flight. Enroute the auxiliary fuel transfer pump was activated to check out the system. Strong fuel fumes were immediately detected and the pilots promptly secured the pump. The odor of fuel gradually dissipated and the flight was completed without further incident.

At destination a check on the discrepancy revealed that the fuel drain lines from the transfer pump were crossed. Photos (1) and (2) show the incorrect connections from the electric motor and gear box to the four overboard bulkhead drains. Photos (3) and (4) show the correct installations. The forward two drains, lower right on photo (2), are pressurized water drains and should be connected to the inlet side of the gear box (covered with masking tape) and the overhead fuel lines. The two after fuel drains (one not shown) are free air vents and should connect to the diaphragm side of the gear box (upper left on photo (2) and the other line, which has a tee fitting, connects to either side of the spline connection between the electric motor and the gear box.

Photo (2) shows the incorrect installation on the PAR aircraft in question. As can be seen, the drain to the inlet side of the gear box was connected to a vent line so that when the transfer pump was actuated, fuel was pumped through the tee fitting into the electric motor side of the spline connection, through the spline and over the side. Also it forced fuel through the wrong side of the gear box washing out the packing, saturating the motor and creating the fumes and a very hazardous condition within the aircraft.

Photo (1) shows a closeup of the incorrect electric motor and gear box installations. When the pilot secured the transfer pump, fuel continued to flow out the after drain due to siphoning effect.

Since the AUX tank installation is not too common most pilots are not familiar with its details and tend to rely on ground maintenance personnel for correct installation. For those in this category it is recommended that they get a good checkout on the proper installation of the fuel lines prior to flying this version of the *Stoof* and then preflight the torpedo bay transfer system with care. If unsure of yourself don't use the auxiliary fuel system or do so, when required, with extreme caution. If fumes are detected when transferring fuel, turn the pump switch OFF, put the smoking lamp out in the aircraft and refigure your *Howgozit* using only the fuel remaining in the two main tanks.—LCDR D. STULL, *Quality Control Officer, VT-31*

*** If an aircraft part can be installed incorrectly, someone will install it that way!**

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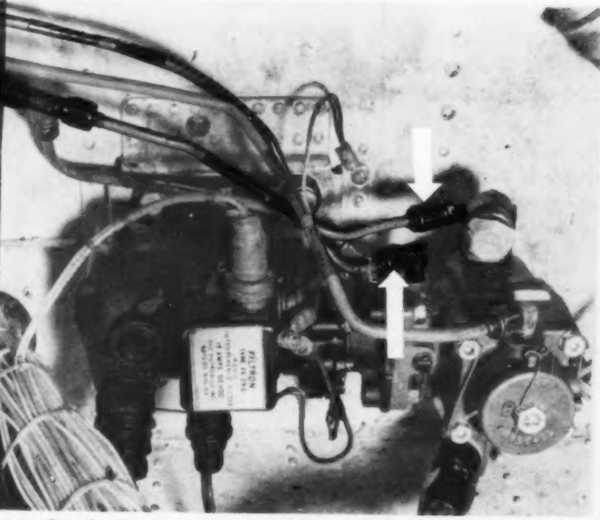
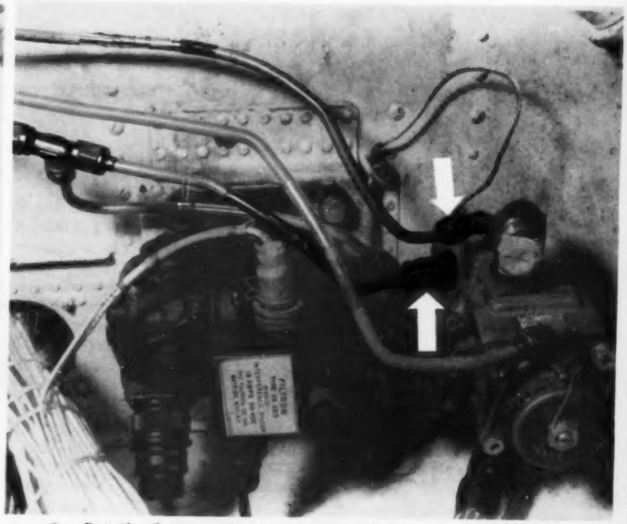
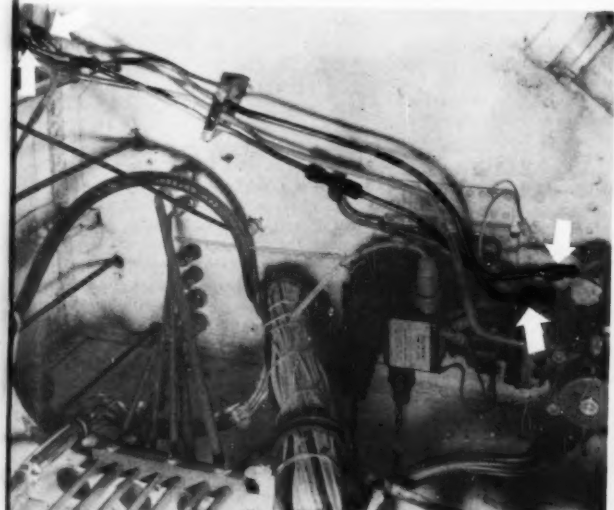


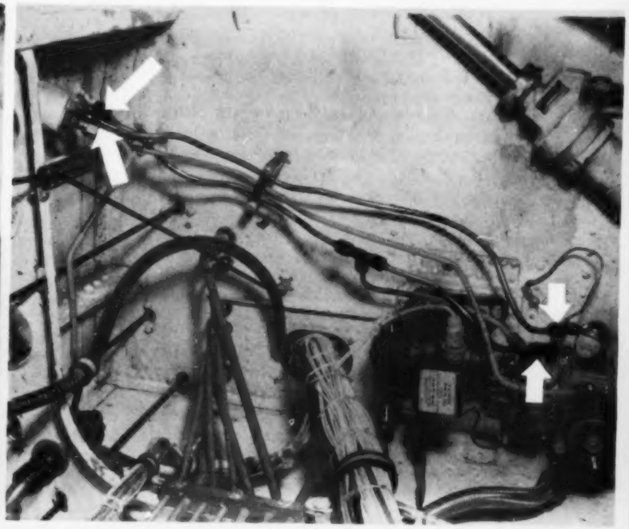
1. Detail of cross-connected fuel lines at fuel transfer pump.



3. Detail of correctly connected fuel lines at fuel transfer pump.



2. Overall view of cross-connected fuel lines showing bulkhead connections.



4. Overall view of correctly connected fuel lines showing bulkhead connections.

Letters

Want your safety suggestion read by nearly a quarter of a million people in naval aviation? Send your constructive suggestions to **APPROACH.**

Air Wing AAR Board

FPO San Francisco—It is well known in attack and fighter squadrons that an AAR board outrightly demands the services of key personnel, i.e., Operations, Maintenance Officers, often at most inopportune times.

During deployed periods with an Air Wing embarked, why not form an Air Wing AAR Board composed of Wing Safety Officers? I recently participated on a board composed of A-3, A-4, and F-4 pilots and aviation ground officers, and though unique, it functioned effectively without tying up key personnel from one squadron. Another favorable point is that Safety Officers can often perform the investigation more expeditiously than officers unfamiliar with AAR proceedings. Of course, technical advice could still be procured from the reporting custodian or factory representatives.

The convening authority would necessarily become CAW, but this need not require revision to OpNavInst 3750.6E, para 31, if the plan is acceptable to squadron COs during deployment.

J. T. O'DER, LCDR
RCVW-12 SAFETY OFFICER

• The Center has already taken steps to incorporate, in principle, the idea you advance. More specifically, the forthcoming change No. 2 to OpNavInst 3750.6E revises paragraph 32 (Composition of AAR Boards) completely.

Effective 1 July 1964 "an aircraft accident will be investigated and reported by a board consisting of *two* qualified officers (one the senior member) from a command other than the command involved in the accident, *plus* the aviation safety officer and flight surgeon from the command involved in the accident. Appointment of the two officers will be the task of the Immediate Superior in Command (ISIC) of the reporting custodian involved in the accident."

Helmet/O_2 Mask

The top pad of my helmet was loose and I asked the flight equipment shop to take care of it. The next day I was scheduled and as I checked the O_2 flow I noticed a strange odor in my mask. I checked my helmet and it was worse. The glue that had been used was apparently very high in alcohol content and my mask had been placed inside the hard hat and had absorbed the odor.

It was such a strong odor that both mask and helmet had to be replaced for the hop.

This can be prevented if a different type glue is used or if that's not possible then air the helmet for 24 hours so as to preclude the above. Also *do not* store with mask during drying.

ANYMOUSE

• We know of no plans to change this glue. Airing 24 hours is the only answer.

Lift Ring

San Diego, Calif.—BACSEB 10-62 contains instructions for incorporation of a lift ring attachment for helo rescue. It is not readily apparent to pilots why this lift ring attachment must be as long as it is, but it is apparent that it can easily reach the pilot's face. Therefore, a good number of pilots are worried about the possibility of losing an eye or a few teeth from the lift ring flailing about during ejection. It would be easy to either shorten the attachment or to tack the ring to the torso harness with some light test thread. Would the Safety Center please comment on this situation?

ANYMOUSE

• Clothing and Survival Equipment Change No. 4 covers shortening of the lift ring. Be sure that No. 6 cord nylon thread is used as GAR specified.

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request. Address: APPROACH Editor, U. S. Naval Aviation Safety Center, NAS Norfolk, Va. Views expressed are those of the writers and do not imply endorsement by the U. S. Naval Aviation Safety Center.

Vest Shortage

Corpus Christi, Texas—This squadron has been using Mk-3C life vests as a replacement for Mk-2 vests on a "temporary" basis for approximately seven months now. This situation developed when we transitioned from 20 P2/P5 aircraft to 50 TS-2As and found that Supply could not handle our increased demand for life vests.

We have had 200 Mk-2 life vests on order for approximately six months and although Supply assures us they are doing everything possible to fill the order, they insist that there are no Mk-2 life vests in the supply system. Their story is that the old contract was canceled before new production commenced and that existing supplies were exhausted before the new model was even accepted and production commenced.

This explanation, although a bitter pill to swallow, has been accepted inasmuch as supply has slipped behind demand on more than one occasion in the past. It is becoming harder and harder to swallow this pill, however, as reports/rumors are coming into the squadron at an increasing rate that other areas are not similarly affected by this "shortage."

This is not a complaint or a request for action. I would merely like to know if a shortage of Mk-2 life vests actually exists, and if so, when relief is expected.

Any light you can shed on this situation will be greatly appreciated.

A. C. TINGLEY
VT-31

• BuWeps and ASO are aware of this problem and are going full bore to correct it.

El Paso International

NAS Dallas—Re your headmouse answer to CDR Thorn in the February issue pertaining to prohibited transient jet flights into joint-use (civil) airfields.

Doesn't El Paso International enjoy special consideration or is its use limited strictly to the Ferry Squadrons?

K. W. LANGFORD
CAPT, USMCR

Twenty Nine Palms, Calif.—In reference to a letter from CDR Thorn and your answer (that the original CNO message was never incorporated into permanent material) be advised that it has been made part of Naval Air Operating Procedures (U) NWIP41 (A) and can be found on pages 4-5 paragraph 431a (2).

W. H. HOLDEN
CWO, USMC

• NWIP41 (A) does contain an exception for pilots ferrying aircraft. Biggs AFB, next door to ELP International, no longer carries any restriction as to "official business only."

Angle of Attack

Cherry Point—"Lack of Knowledge," page 4, May issue had a couple of very good effects on our squadron. For one thing, it stirred up a very heated controversy in the readyroom, and for another, it forced me to dig into some reference material for some answers. Many of us had believed for a long time the three o'clock position on the angle-of-attack indicator showed the best approach attitude (speed) for all configurations. Now we find that it ain't necessarily so.

The angle-of-attack indicating system has proven itself to many a skeptical throttle jock since its incorporation a few years back. Just about all hands will now readily agree that there's no finer way to make an approach and landing. With this degree of acceptance in the bag, I think it's about time that we started to pick up some of the other really valuable information this little jewel can provide. To quote from "Aerodynamics for Naval Aviators," "Generally, the conditions of stall, landing approach, takeoff, range, endurance, . . . , all occur at specific values of lift coefficient and specific airplane angles of attack." Further, ". . . an angle-of-attack indicator . . . is not directly affected by gross weight, bank angle, load factor (G), velocity, or density altitude."

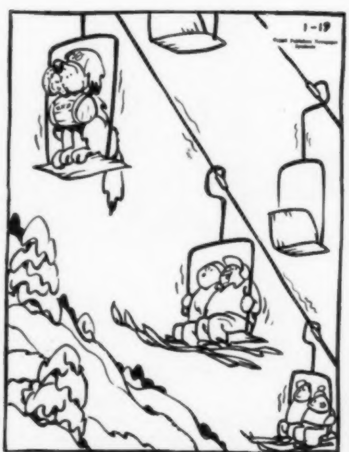
Current Flight Manuals and NATOPS Manuals usually set up a specific airspeed or mach number, for example, for max endurance. This has to be a ballpark figure because of variations in gross weight, density altitude, . . . The other extreme is reached when the pilot is presented with a long series of graphs with which he is expected to determine max range airspeed for a given altitude. Change the altitude and you have to go back to the book. Most pilots, myself included, react to a handful of graphs, charts and computers with a blank stare and complete disinterest. On the other hand, give them specific figures to read on a simple cockpit instrument and the enthusiasm will be second only to happy hour.

How Did You Cope With the Problem?

Questionnaires on APPROACH magazine are handed out by NASC personnel on their visits to squadrons and air stations.

One of the most frequent comments is similar to this one from an instructor at Pensacola. "I would like to read about some of the pilots and crews who coped with various problems and solved them in a professional manner. I know that these are printed from time to time, but I believe that if a few of these were included monthly they would be received well."

We of APPROACH agree – but we can't print what we don't receive. So grab the nearest Anymouse form or stationery and report your experience – past, present, and future.



"This IS a switch . . . he's on a rescue mission to a helicopter pilot!"

If I'm reading the book correctly, for any given aircraft, with a given configuration, there is a best angle-of-attack for takeoff, best climb angle, max range cruise, max endurance cruise, max range glide, best approach speed, and stall at any power setting. In addition, the fighter pilots will be delighted to find that best turning performance can be found right on the indicator. Best of all, these values never change with changes in altitude or gross weight.

I've asked our tech rep to get the figures from the Grumman slip stick factory for our F-9s. My suggestion is that the Center get the dope for all Navy aircraft equipped with angle-of-attack indicators from the respective manufacturers and publish them in APPROACH. The NATOPS folks might very well jump on the bandwagon shortly thereafter.

P. B. LEE, CAPT USMC
ASO, VMT-1

• The Safety Center is in the process of obtaining the dope you mentioned.

The AOA indicator was designed as a landing aid and as such works fine. It is not sensitive enough at the higher airspeeds to give accurate cruise information, although it does put you in the ball park.

It serves as a good substitute for a frozen airspeed indicator during penetration or approach. This substitute was recently instrumental in saving 2 F-4s. Another recent F-4 strike occurred because the AOA was not utilized when the airspeed indicator froze.

approach

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NavWeps 00-75-510

Our product is safety, our process is education and our profit is measured in the preservation of lives and equipment and increased mission readiness.

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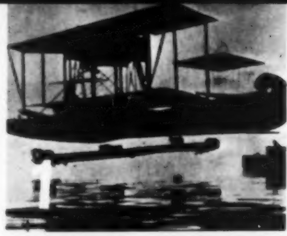
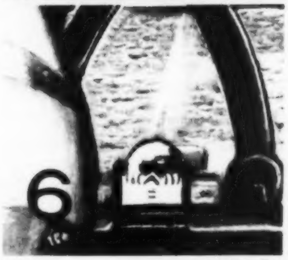




CREDITS

Page 38 Courtesy Aviation Mechanics Bulletin

Page 39 Photos Courtesy McDonnell Aircraft

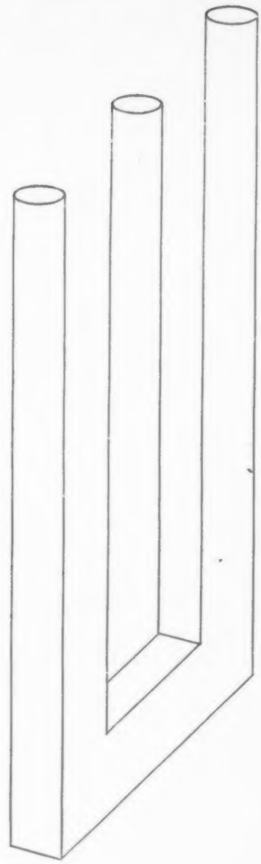
Page 47 Courtesy George Lichty, Publishers Newspaper Syndicate

Inside Back Cover: Courtesy American Machinist

Purposes and policies: Approach, published monthly by the U. S. Naval Aviation Safety Center, is distributed to naval aeronautical organizations on the basis of 1 copy per 10 persons. It presents the most accurate information currently available on the subject of aviation accident prevention. Contents should not be considered as regulations, orders, or directives. Material extracted from mishap reports may not be construed as incriminating under Art. 31, UCMJ. **Photos:** Official Navy or as credited. Non-naval activities are requested to contact NASC prior to reprinting Approach material. **Correspondence:** Contributions are welcome as are comments and criticisms. Views expressed in guest-written articles are not necessarily those of NASC. Requests for distribution changes should be directed to NASC, NAS, Norfolk, Va. 23511 Att: Safety Education Dept., if you are receiving the magazine free because of military or commercial contract status with the Navy. . . . IF YOU ARE A PAID SUBSCRIBER, address all renewals and change of addresses to Superintendent of Documents, Washington 25, D. C. **Subscriptions:** Single copy 35 cents; 1-year subscriptions \$3.50; 2 yrs., \$7.00; 3 yrs., \$10.50; \$1.00 additional annually for foreign mailing. **Printing:** Issuance of this periodical approved in accordance with Department of the Navy Publications and Printing Regulations, NAVEXOS P-35. Library of Congress Catalog No. 57-60020.

LIFT and DRAG

How many prongs?
Are they round or square?



Look at the top of the figure—note the three round prongs.

But look at the bottom. . . ?

It's much the same with the safety problem. You can look at it any number of ways and each time get a different viewpoint.

But if you cover the top of the figure, and **look all around** the diagram, what do you see?

The answer to the safety problem—U. To be frank, YOU and I and everyone else in naval aviation are the major factors in more than 70% of our accidents.

If there is any one all encompassing answer to reducing the accident problem, it is the human factor—be it caused by pilot or maintenance man, designer or manufacturer.

Two large programs are underway to create a quantum jump in aviation safety—one a **human factors campaign,** which you read about in the May issue. The other—**design safety**—is treated in this issue, pages 12 through 15, 24 and 25.

Design safety offers an opportunity to coordinate safety considerations in the design, procurement, production, operation, and maintenance of naval aircraft in a manner and to a degree never before envisioned or possible.

T. W. SOUTH II
COMNAVAVNSAFCEN


TAKE CARE OF THEM!